JULY, 1949

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING — PIPING — REFRIGERATION — AIR SANITATION

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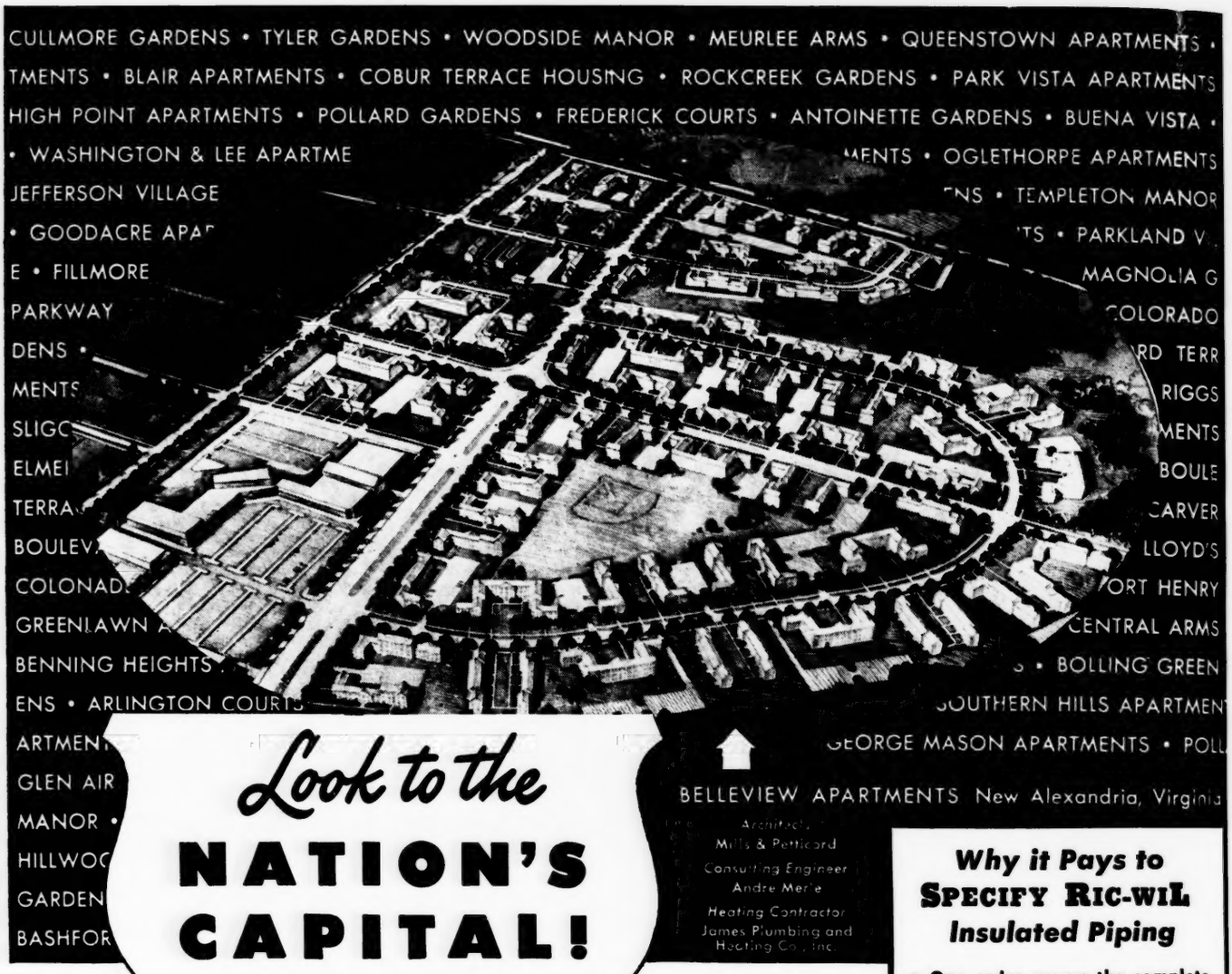

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HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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The INDUSTRIAL PRESS

THIS MONTH'S COVER

A concept of the size of modern drive-in motion picture theatres is given by this aerial view of a drive-in theatre in Los Angeles, Calif. For information on air conditioning and heating such theatres, see page 57. Photograph, courtesy *Better Theatres*.

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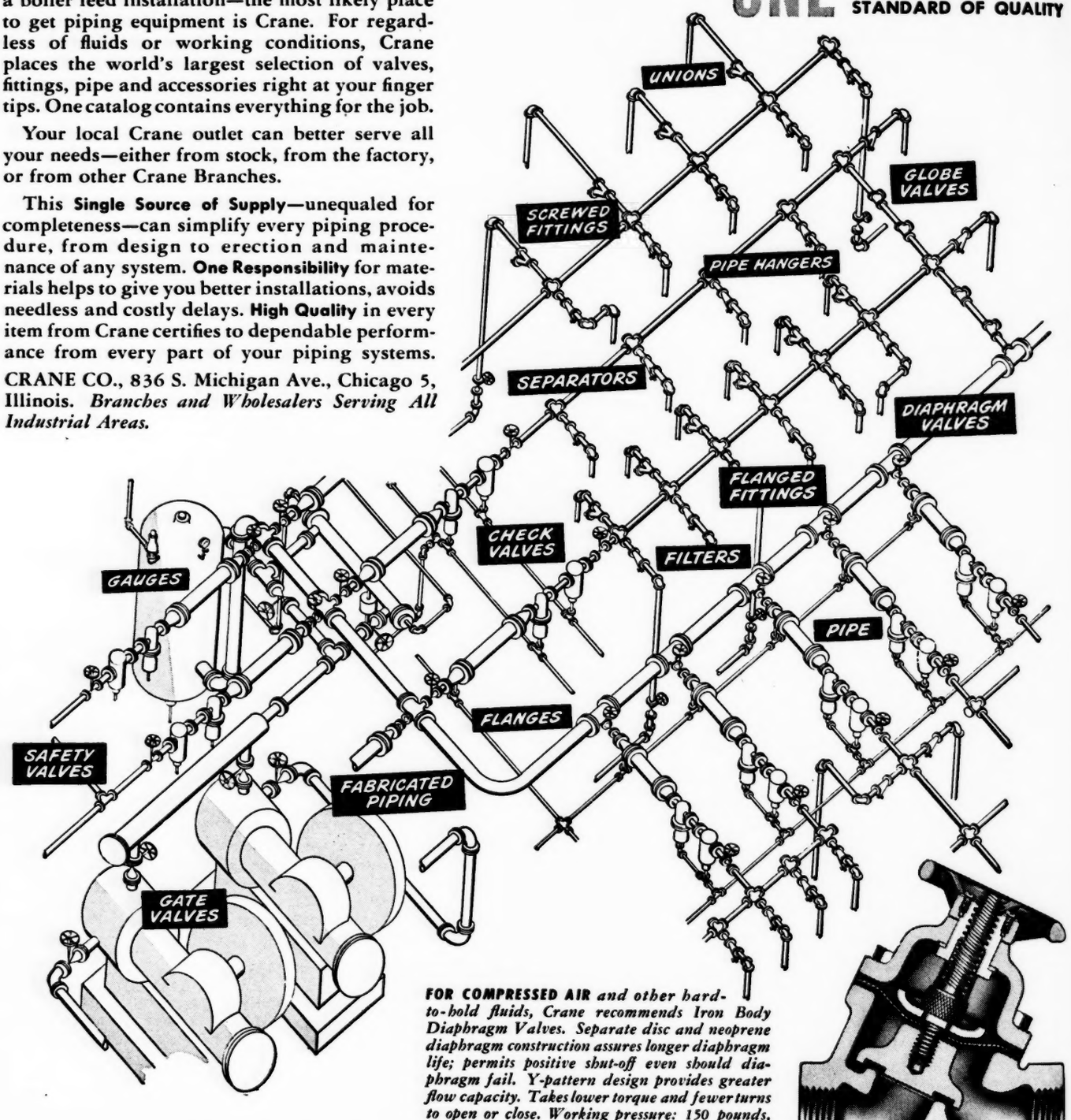

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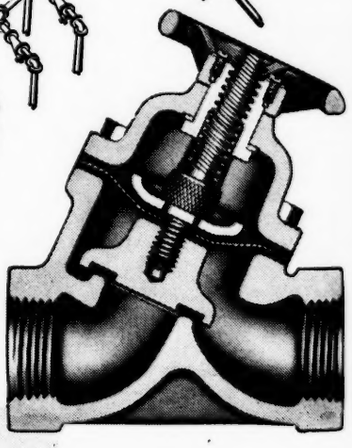

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Washington News

LORING F. OVERMAN

PERHAPS members of Congress have concluded that there are worse places to spend the summer than in the air conditioned House and Senate chambers. For as June merged into July, Congress still had mighty little in the way of approved legislation to show for its six months of Washington residence, and the President has promised that adjournment on July 31 may as well be forgotten if action isn't forthcoming speedily.

Observers are beginning to speculate that adjournment about August 20 is likely—that being 60 days after the filing by President Truman of seven reorganization plans patterned after Hoover Commission recommendations. The reorganization proposals would become effective if not rejected by one branch of Congress within 60 days. In the face of its inability to produce much itself in the way of new legislation, it is considered likely that Congress may decide to remain in session for the extra 20 days in order to make the reorganization proposals good, while at the same time devoting some extra time to settling pending bills.

Greater efficiency is the chief objective in the initial plans submitted to Congress by President Truman following his approval of the new reorganization law. No immediate economies are anticipated, the purpose of the seven changes being to provide for greater flexibility of internal organization, clearer responsibility, and more effective administration.

Of total savings of $3 billion or more estimated as possible if all recommendations of the Hoover Commission were adopted, more than half would be in the military establishment, which is not affected by the initial plans submitted. Administative savings are hoped for as gradual results of the present proposals, but it is conceded that large reductions in costs can come only from curtailment of Government spending programs.

Reorganization Plans Summarized

Because some of the proposed reorganization changes will have an effect upon heating-ventilating-air conditioning industry contacts with Government, a run-down of the current proposals may prove interesting:

Plan No. 1 transforms the Federal Security Agency into the Department of Welfare, gathering powers now scattered among subsidiary units into a single department. Still under consideration are some details equipment are over age. I see nothing in the past history of American business to justify the thought that from the armed services.

Plan No. 2 would transfer the Bureau of Employment Security from the Federal Security Agency to the Department of Labor, and would transfer functions of the Veterans' Placement Service Board from that Agency to the Secretary of Labor.

Plan No. 3 would vest in the Postmaster General authority now scattered among subordinate officials, and would create an advisory board.

Plan No. 4 would place in the Executive Office of the President the National Security Council and the National Security Resources Board.

Plan No. 5 would make the chairman of the Civil Service Commission its chief administrative officer.

Plan No. 6 would make the chairman of the Maritime Commission its chief executive and administrative officer.

Plan No. 7 would transfer the Public Roads Administration from the Public Works Agency to the Department of Commerce. Most other agencies in the Federal Works Administration would be absorbed by the new General Services Administration proposed in pending legislation.

In addition to the seven plans proposed, about 15 bills embodying Hoover Commission proposals, have been introduced in Congress. In each, a fundamental principle running through all Hoover Commission recommendations is apparent—that department heads should have sufficient authority to permit them to carry out responsibilities assigned to them by the Constitution and Congress.

Economy Idea Paradoxical

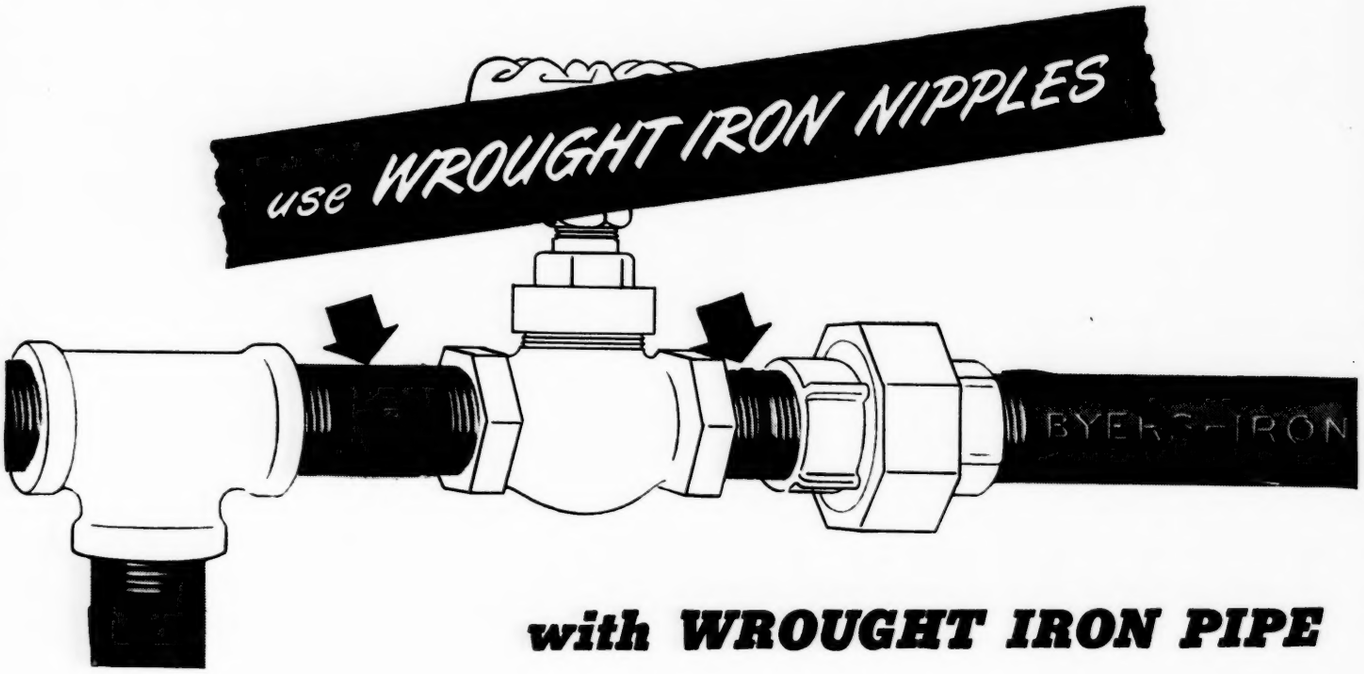
To find Congress and the Administration receptive to some of the economy suggestions included in the Hoover recommendations is considered encouraging by some. On the other hand, there are some who suspect that being able to point to dollars saved through Hoover devices, may be merely the signal for proposing other increased expenditures.

As June ended, however, there was added evidence that members of Congress are a bit shaky about increased budgets at a time when the business weather vane continues to point toward storms of varying and unknown intensity ahead. The word "recession" is now acceptable in the Washington vocabulary, but another has been coined which sounds better politically. The word is "disinflation," and its coiner is Dr. Nourse, one of the President's economic advisers.

"Disinflation," he explains, "means deceleration, but not the kind of uncontrolled or clumsy deceleration that makes the plane nose over or go into a ground loop."

Contending that conditions are basically sound, Dr. Nourse observed: "We are not lacking in liquid funds or credit reserves. We are not overbuilt or top-heavy with inventory. Our population is in a new phase of growth in numbers and wants. Expanding families are clamoring for more and better homes. Expanding communities are clamoring for more public service facilities. Automobiles, rolling stock, and much plant equipment are over age. I see nothing in the past history of American business to justify the thought that business genius will fail to exploit these markets."

Avoid "Weak Links" in your piping systems—



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When you specify wrought iron pipe to lick some corrosion problem, assure 100% protection by specifying that the pipe nipples also must be wrought iron. Neglect of this simple precaution will leave weak spots in your lines, and set the stage for maintenance headaches.

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Merely stating that the piping "system" is to be black or galvanized wrought iron is not enough; the use of wrought iron nipples should be specifically designated. This may be done by requiring that the wrought iron nipples shall be made of pipe conforming to the requirements of A.S.T.M. Specification A72-45, Federal Specification WW-P-441a, Navy Specification 44P11k, or any accredited proprietary specification.

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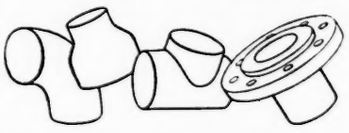
The word "Byers" and the weight —either "Std." or "X Stg." are machine stamped around the circumference of Byers Wrought Iron nipples. On close nipples, where it is impractical to stamp on the threads, a red band is used. These markings provide quick, positive identification of Byers Wrought Iron nipples, and help to avoid any danger of accidental substitution of non-durable nipples in the line.

IN WELDED SYSTEMS USE WROUGHT IRON WELDING FITTINGS



Wrought iron welding fittings are available in a wide range of types and sizes from leading fitting manufacturers. Just contact your supplier.

Wrought iron nipples are also available from a number of manufacturers. The identification used on such nipples may be learned by consulting the supplier.

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The superior resistance of wrought iron nipples comes from the unique composition and structure of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and "detour" corrosive attack, and so discourage pitting. The fibers also anchor the initial protective scale, which shields the underlying metal.

The best guide in applying wrought iron is a knowledge of its character and properties. The complete story is presented in the booklet, "The ABC's of Wrought Iron". Ask for a copy.

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BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Other Washington observers, conceding today's uncertain conditions, contend that everything will smooth out alright under two conditions:

1. If management will cut prices wherever possible to tap the reservoir of spending power in the country, and put on aggressive merchandising campaigns, and;
2. If organized labor will be content with moderate "gains" which would not increase the price of goods or services.

These observers point out that the reverse of the foregoing ideas, and the danger for the future, is that management will cut back production sharply to avoid reducing prices, and that labor will strike for fourth-round increases which, if granted, would inevitably increase prices.

AFL Interprets Trend

In its Monthly Survey, the AFL is the first of the labor organizations to take cognizance of tomorrow's possibilities.

"Downward price adjustments, now definitely under way at wholesale levels, have changed the business picture basically since January, 1949," says AFL. "The employer's economic joyride, when unrestrained price increases brought high profits, is over. Competition is back; prices can no longer be raised indiscriminately to cover higher costs. Business executives show new interest in cutting expenses. Production per man hour is rising sharply. These are healthy developments which can bring business to its normal postwar balance.

"The Federation recognized, however, that a period of falling prices brings certain dangers. Accompanying declines in production, employment and buying power could carry disinflation into a business recession. Policies followed by unions, management, and Government are all important. We emphasize these points as vital:

"Wages must move steadily upward this year to restore and increase consumer buying.

"Wage increases should be based on past or future increases in productivity to prevent undue rises in costs; company earning power should be considered.

"Action that would start price inflation again must be avoided by Government, management, and unions."

High Productivity Important

With Congress, management, and labor all eyeing the weather vane, it is interesting to note that another Government Bureau—Labor's Bureau of Labor Statistics—came out during June with eulogies of production as the key to all problems.

To develop an acceptable standard of measuring the productivity of modern industry, the Bureau of Labor Statistics has undertaken a little-publicized study. The goal is to assemble, within the next year or so, the data necessary to determine how efficiently our industrial plant is producing, and to discover the methods and procedures through which these data can be used from year to year to indicate accurately the trend.

So far BLS has completed studies in the manufacture of footwear, men's shirts, leather, fertilizer, industrial equipment, construction machinery, tools, and soap. More than 30 additional industries are scheduled for study before a composite index can be attempted. The composite index used in the past was based on employment data gathered by the Labor Department and production data gathered by the Department of Commerce biennial Census of Manufactures. No census was taken between 1939 and 1947. Data for the latter year is still being digested, so that the last overall index of productivity is that of 1939.

The BLS observes that, as a result of private studies, there is reason to believe that in the last decade the steady expansion of production per man hour has been interrupted. The BLS study seeks to point out any existing weaknesses, and to encourage a return to productivity standards that existed up to and including the war years.

Construction May Hit $19 Billion

Throughout the many forecasts, the spottiness of current conditions is stressed. Construction, for example, continues on the "up" side, according to the Department of Commerce announcement of June 25. Value of new construction to be put in place this year may reach a record total of $19 billion, 1% above the revised figure of $18.77 billion for 1948, the department estimates.

In addition, officials of the Department's Construction Division pointed out, if construction costs continue to decline, the physical volume of construction in 1949 might show a somewhat larger percentage increase over 1948 than the dollar value.

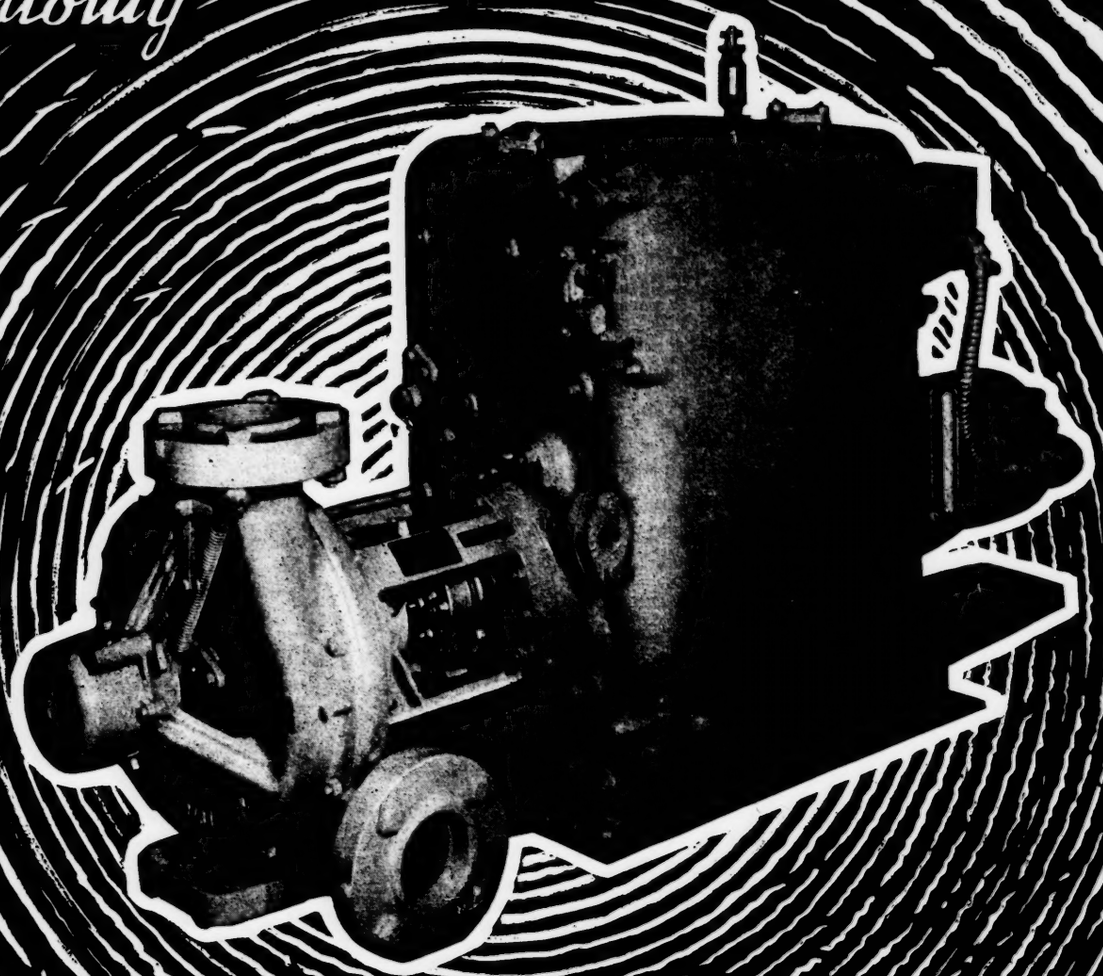
The current estimate is based on a mid-year review of new construction activity during 1949, and of the outlook for the balance of the year. The increase is reported as due largely to a higher level of construction activity by privately owned public utility companies than was anticipated, and to a larger than anticipated increase in the total amount of public construction.

It is now expected that the value of public construction this year will be about $5.17 billion, or 23% above 1948. Greatly increased rates of hospital and school building will account for a large portion of the anticipated increase. State and local housing projects, Federal conservation and development work, and extension of sewer and water facilities will also contribute substantial amounts.

Total value of new private construction is expected to reach $13.82 billion, about 5% less than last year. New non-farm home building, at about $6.5 billion, will account for nearly one-half the total, but will be about 10% below last year's revised figures.

The continuing decline in industrial construction is expected to result in a drop of about 28% for the year, while the value of work done on new stores, restaurants and garages will be about 11% below the total for 1948. The outlook for warehouse, office and loft building is about the same as last year, but other types of nonresidential building are expected to show a 28% increase, principally as a result of 30 to 50% advances in work on new churches, recreational facilities, hospitals and institutional buildings.

Centralized Heating Economy



A RETURN LINE VACUUM PUMP THAT CUTS HEATING COST.

This unusual pump needs no electric current, cutting out greatest item of pump operating expense.

More important, this pump insures absolutely uniform circulation in system. That means continuous steam economy.

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THE NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

Next to metallurgical composition, heat treatment has been the most important factor in adapting steel to its many thousands of uses. For centuries the quest for better weapons forced man to practice the "art" of heat treating and quenching steel, but only in recent years has this "art" become a science. It is a science of carefully controlled temperatures in the quenching bath.

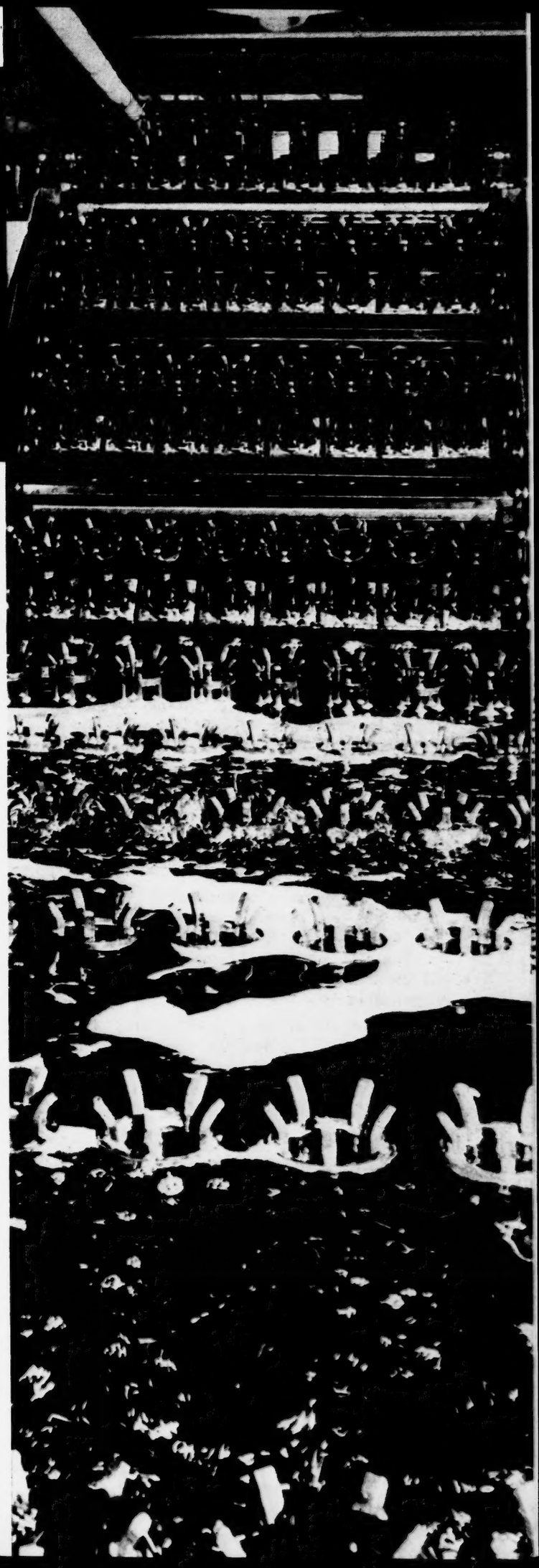
CARBON steel is made up of a solid solution of carbon in iron (ferrite) mingled with the metallic compound iron carbide (cementite). When carbon steel is heated to the lower critical temperature, approximately 1335F, the iron begins to absorb the carbon in the cementite. This absorption continues as the temperature rises until, at the upper critical temperature, the cementite disappears. There now exists a solid solution of carbon in iron known as austenite. If the steel is now cooled slowly, the dissolved carbon separates from the iron and a mechanical mixture of thin layers of ferrite and cementite once more appears. Because, when viewed with a microscope, the structure resembles mother-of-pearl, the mixture is known as pearlite.

If the cooling rate is increased the dissolved carbon separates from the iron, but the grains of ferrite and cementite have less opportunity to grow. The result is a fine-grained pearlite usually known as primary troostite which is considerably harder than the normal form of pearlite. Steel treated in this manner is relatively strong and tough.

Very rapid cooling of austenite allows practically no time for the dissolved carbon to separate from the iron. The steel formed by this process is known as martensite. The structure is in an unstable condition characterized by a high degree of hardness. Martensitic steels are strong but extremely brittle.

Purposes of Heat Treatment

The purposes of heat treating are many-fold. The principal reason for the commercial heat treatment



Portion of quenching tank and conveyor ⟶

of carbon steels is to obtain one or more of the following properties.

(1) Increased strength.
(2) Increased toughness.
(3) Increased hardness.
(4) Improved machineability.
(5) Increased wear resistance.
(6) Reduced brittleness.
(7) Relief of internal strains.

In general, heating and slow cooling induce softness. This treatment relieves internal strains. If grain growth has not been too great, the heating and slow cooling process also increases toughness, improves machineability and reduces brittleness.

Heating and rapid cooling produces hardness. Also, this type of treatment increases strength, brittleness and wear resistance but decreases toughness and ductility.

The final hardness attained in any heat treating process depends upon:

(1) Composition of the steel.
(2) Grain size.
(3) Mass of the individual pieces of metal being treated.
(4) Cooling rate of the quenching medium.
(5) Agitation of the quenching bath.
(6) Temperature control of the quenching or tempering bath.

Methods of Quenching

Quenching is the rapid cooling of steels that have been heated to a temperature approximately 100F above the upper critical temperature. Basically, quenching is employed to increase strength, hardness and wear resistance. The rapid cooling is accomplished by directing a blast of cold air against the heated metal or by immersing the heated steel in a liquid bath. The cold air blast method provides the slowest of all quenching processes.

The use of the liquid bath is the most general method of quenching. Various baths may be utilized; namely (1) water, (2) brine, (3) oil, (4) molten salt, or (5) molten lead. Of these, water, brine or oil quenches are probably the most common, and for commercial applications the oil bath is most widely employed.

Quenching Media

If the cooling rate of still water at approximately 68F is taken as the standard for comparison, the relative cooling rates of various quenching media are approximately as follows:

Quenching Medium	*Relative Quenching Rate*
Still water at 68F	1.00
Mineral base quenching oils	0.30 to 0.40
Cottonseed oil	0.35
Neatsfoot oil	0.30
Fish oil	0.30
Machine oil	0.20
Transformer oil	0.10

It should be pointed out that while the oil baths produce a slower rate of cooling at shop temperature, their cooling power is not seriously diminished at higher temperatures as is a brine or water bath. As the bath temperature approaches the boiling point of water, the quenching rate of water is rapidly reduced until it is approximately equal to the quenching rate of light oil. Therefore, it is apparent that an oil bath is able to maintain a more uniform quench rate over a broader range. Unlike water and the light oils, the quenching rate of heavy oils increases to a certain point with a rise in temperature. Beyond this point the quench rate may decrease as the temperature continues to increase.

Since the cooling rate of the bath controls the properties of the treated steel, the selection of proper quenching media is important. The efficiency of a quenching liquid is dependent upon its specific heat, volatility, viscosity, thermal conductivity, latent heat of vaporization, initial temperature and the quantity of the liquid. The quantity and specific heat control the amount of heat that the bath can absorb with a given temperature rise. Viscosity affects the flowing properties of the liquid, hence the heat dissipated by convection, The viscosity is important because the heat is carried away from the metal to the adjacent liquid by conduction, and this heat must be further transported to the remote parts of the bath by convection. Volatility is indicative of the temperature at which the liquid will vaporize and form a gaseous film on the surface of the metal, thereby retarding the cooling rate. If the latent heat of vaporization is high, much heat will be required to change the quenching medium from the liquid to the gaseous state. Since the rate at which heat is transferred from one body to another varies directly as the temperature difference between the bodies, it is evident that the initial bath temperature affects the rate of cooling. As a precautionary measure, it should be borne in mind that when using oil as a quenching medium, it is imperative that the oil have a high flash point.

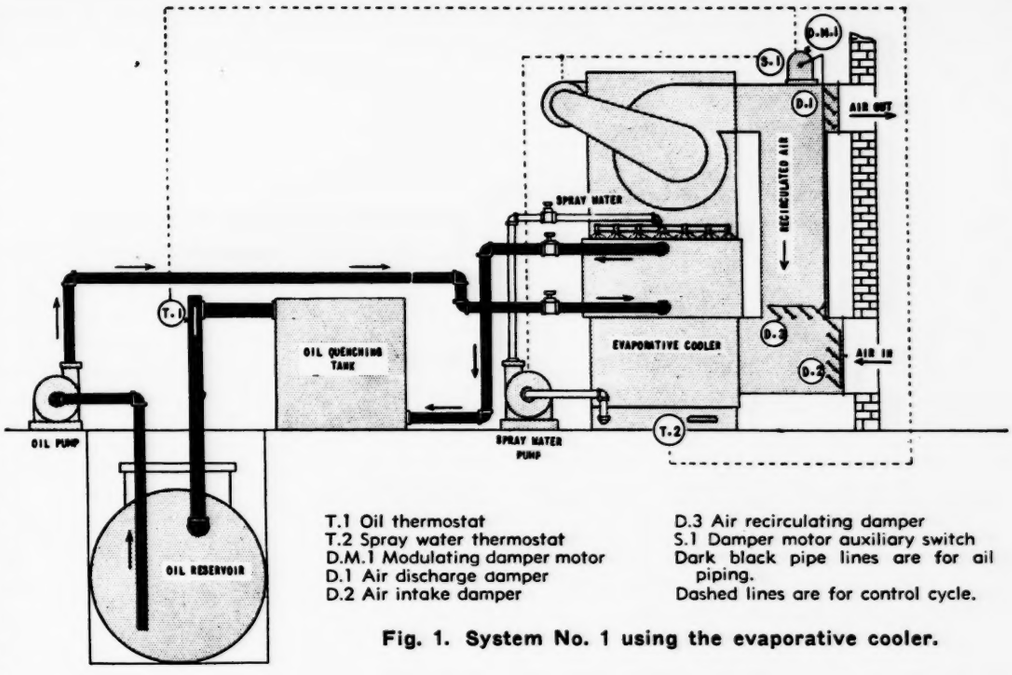
Quenching Procedure

Accurate control of conditions in the quenching tank is equally as important as accurate control of furnace temperatures and atmospheres. Controlled quenching insures that all specimens quenched under identical conditions will be identical in quality.

There are two distinct methods of quenching—the continuous quench method and the batch quench method. In the former method the pieces being quenched are immersed in the bath at a continuous rate. Therefore, the cooling load is, for all practical purposes, continuous and uniform. In the latter method the metal is immersed in the oil at regular or irregular intervals with a relatively long time between operations. For batch quenching the cooling capacity of the oil cooling equipment can be considerably smaller than for continuous quenching, since the intervening time between quenches can be utilized to absorb the heat from the bath.

The volume of the quenching tank is determined by

the size of the piece or pieces to be accommodated and the quantity of oil required to absorb the heat rejected by the metal based upon a predetermined temperature rise of the bath. In either batch or continuous quenching, the rate at which the steel releases its heat determines the rate at which the quenching medium must be circulated through the tank. Continuous quenching demands the oil be circulated at a rate equivalent to that required to absorb the heat from the metal. For the batch quench method the rate of oil circulation is dependent upon the interval between quenches.



T.1 Oil thermostat
T.2 Spray water thermostat
D.M.1 Modulating damper motor
D.1 Air discharge damper
D.2 Air intake damper
D.3 Air recirculating damper
S.1 Damper motor auxiliary switch
Dark black pipe lines are for oil piping.
Dashed lines are for control cycle.

Fig. 1. System No. 1 using the evaporative cooler.

To prevent the formation of a vapor blanket on the steel, it is necessary that turbulence be maintained in the bath. Among the advantages gained by turbulent circulation are elimination of irregular surface hardness, better quality of steel, greater quantity quenched in a given time period, less possibility of fire, conservation of time and decreased losses of oil due to evaporation.

Cooling Problems Involved

In cooling quenching oils the problem is principally one of the removal of heat from the quenching bath. From the standpoint of convenience, there is the additional problem of adopting a method of cooling which is sufficiently flexible to provide year 'round operation and uniform bath temperatures. Where the atmospheric cooling principle is used, precautions must be taken for protection against freezing.

Further, it may be necessary to provide facilities to heat the bath after periods of system shutdown, during which time the bath approaches shop temperature. If oil temperatures are too high entering the coils or other heat transfer surfaces, the possibility of liming cannot be discounted. It is recommended that the oil temperature entering the cooling equipment not surpass 165F. This does not prohibit bath temperatures being in excess of 165F, but in cases where this temperature is exceeded a by-pass arrangement should be employed.

Cooling Systems

Since quenching bath temperatures are generally maintained between 100F and 150F, it is quite often possible to use a comparatively high temperature cooling medium. In the case of the higher range of temperatures, there exists the possibility of utilizing water at approximately 100F or less. Also, for the upper and middle range the use of the atmospheric evaporation principle can be used. For the lower temperatures, and particularly where bath temperatures are lower than the ordinary limits indicated above, low temperature sources of cooling or possibly refrigeration may be required.

The selection of proper equipment is governed principally by:

(1) Quantity, quality and temperature of water available for cooling.
(2) Pumping costs.
(3) Ability to obtain a continuous supply of satisfactory cooling water.
(4) Outdoor summer design wet bulb temperatures.
(5) Available space to accommodate selected equipment.

Four recommended systems illustrated in Fig. 1 to 4* for cooling quenching oils are:

System No. 1—Use of the evaporative cooler.
System No. 2—Use of the shell and tube heat exchanger (where adequate cooling water is available.)
System No. 3—Use of the evaporative cooler supplemented by the heat exchanger and refrigeration.
System No. 4—Use of 100% refrigeration.

Use of the Evaporative Cooler

The utilization of the evaporative cooler is recommended as a compact means of oil cooling by the atmospheric evaporative principle in cases where:

(1) Use of excessive amounts of water is uneconomical.
(2) Quantity of water available is insufficient.
(3) Temperature of available water is too high.
(4) Temperature of quenching medium is 100F or above.

*Drawings and control diagrams are diagrammatic and indicate only the sequence of operation. They do not indicate exact equipment location, wiring diagrams for controls, etc. Such matters are subject to changes or modifications to fit individual projects.

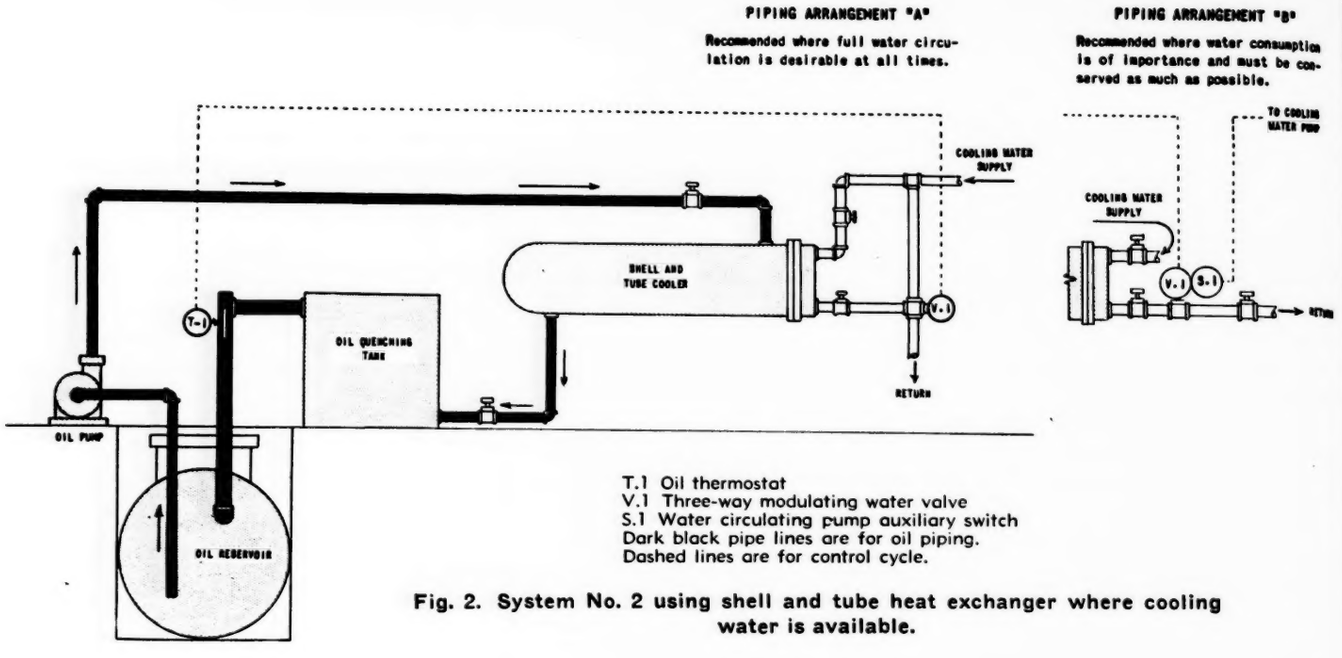


Fig. 2. System No. 2 using shell and tube heat exchanger where cooling water is available.

(5) Wet bulb temperatures are not too high.
(6) Water is of poor quality due to corrosive properties, excessive dirt, etc.
(7) Possibility of water supply failure exists.

The evaporative cooler is readily adaptable to automatic control, and the prevention of freeze-up of the sprays or water tank during intermittent, partial, or full load conditions in cold weather operation. Water consumption is almost negligible permitting the use of tape water, thereby making the supply of make-up water as positive as the source of supply. In this method of oil cooling, the temperature of the water is of no importance.

Where bath temperatures are maintaned above 165F, it is advisable to install a by-pass around the evaporative cooler so that a portion of the cooled oil is mixed with the returning high temperature oil from the quenching tank. This prevents oil in excess of 165F entering the cooler coil. Such an arrangement will, of course, necessitate the circulation of a larger quantity of oil—the actual quantity depending on the temperatures of the oil involved. Holding the entering oil temperature under 165F will tend to prevent liming of the coil. The evaporative cooler method is shown diagrammatically in Fig. 1.

In laying out an atmospheric evaporative system the evaporative cooler should be installed in a location where fresh air and exhaust air can be readily piped into and out of the unit. It is further recommended that the ducts be as short as possible to reduce the external static pressure. Naturally, the cooler should be located as close as possible to the quenching tank so as to reduce oil pumping and piping installation costs.

Automatic Control for System No. 1

Automatic control of the evaporative cooler is recommended through the use of modulating dampers D-1, D-2 and D-3. These three dampers are operated simultaneously by damper motor DM-1 to permit sufficient fresh air to be admitted to the system as required by the oil cooling load. Dampers D-1 and D-2 are direct connected, while D-4 operates in the opposite direction.

Thermostat T-1 is installed in the warm oil line from the quenching tank. This theromstat controls damper motor DM-1. When the damper motor completely closes dampers D-1 and D-2, the evaporative cooler fan and pump motors are stopped by auxiliary switch S-1. When the fresh air and exhaust dampers begin to open, the motors are started by switch S-1.

T-2 is a thermostat with a heat sensitive element installed in the spray water. This is a limit control to prevent the spray water from dropping below a predetermined low temperature. This precaution is recommended to prevent freezing of the spray water or undue thickening of the oil.

With thermostat T-1 installed in the hot oil line from the quench tank, the oil circulating pump motor should operate continuously so that the oil temperature at the thermostat will be at the same temperature as the bath. Intermittent oil circulation would prevent the thermostat registering true tank temperature. If the thermostat is installed in the quench tank, operation of the oil circulating pump may be interrupted when the unit motor is stopped.

Where danger of freeze-up of the evaporative cooler exists, it is recommended that the control equipment be arranged to completely close dampers D-1 and D-2 in the event of power failure. When bath temperatures higher than 165F are incurred, a 3-way valve should be installed at the junction of the by-pass and the main oil line. This valve is controlled by a temperature controller in the oil supply line to the cooler.

Use of the Shell and Tube Heat Exchanger

In the event the cooling water supply available is satisfactory with respect to temperature, quantity, quality and cost, a shell and tube heat exchanger will undoubtedly be the most economical solution to the problem. When selecting the shell and tube heat ex-

changer, care should be exercised to insure that the initial economy gained by the selection of a relatively small exchanger is not lost through excessive pumping costs.

As indicated in Fig. 2 the heat exchanger method of cooling quenching oil is the simplest to lay out, requires the least equipment and is the most compact of the four systems recommended. However, this system requires a constant source of adequate cooling water which may be supplied from the city mains, rivers or lakes. If city water is used, the cost should be carefully weighed against the operating costs of the atmospheric evaporative system. When cooling with river or lake water, there is a greater possibility of foreign deposits in the system, and in most such cases the pumping costs would be considerably higher than those encountered in the atmospheric evaporative system.

In this system the oil is circulated by the pump from the quench tank, through the shell side of the exchanger and returned to the tank. The cooling water passes through the tubes of the exchanger and is carried away. Here again it is recommended that the temperature of the oil entering the exchanger not exceed 165F. If higher bath temperatures are maintained, a by-pass arrangement similar to that suggested for the evaporative cooler should be employed. As mentioned before, this will result in an increase of the quantity of oil circulated.

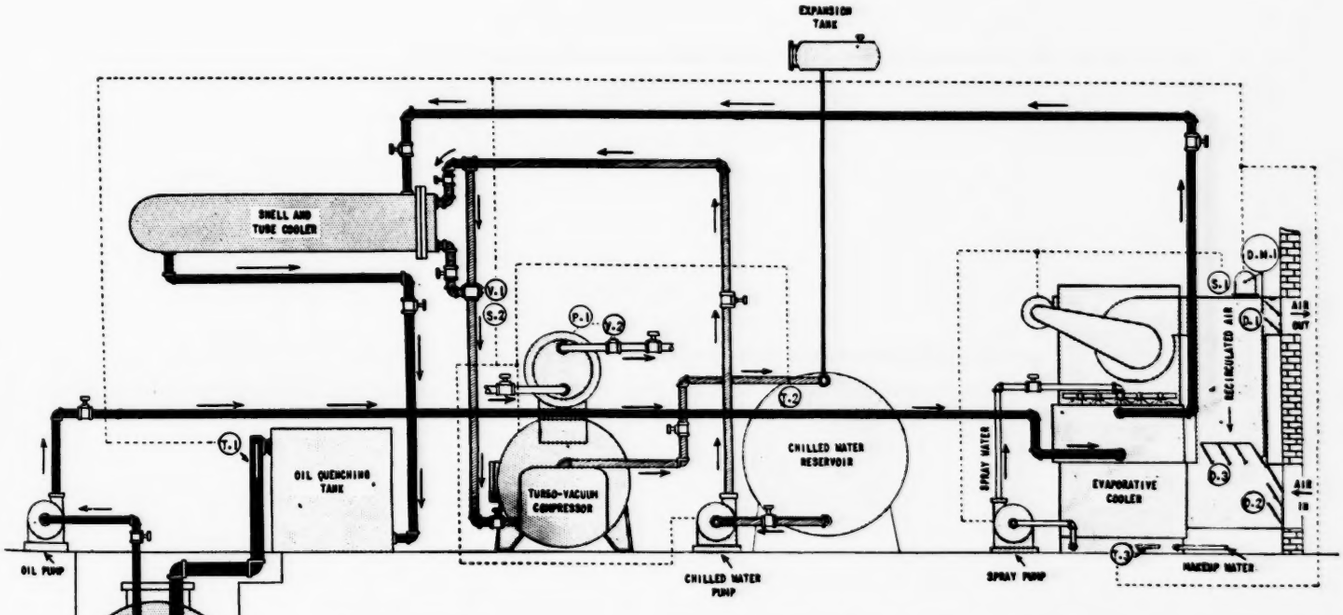
Automatic Control for System No. 2

The recommended control for the shell and tube exchanger method consists of circulating the oil through the exchanger in full volume and modulating the quantity of cooling water by means of an automatic modulating or throttling type valve V-1 in the return water line. Valve V-1 is regulated by thermostat T-1 located in the hot oil line from the quenching tank. If at all times full water quantity circulation is desirable, a 3-way valve V-1 and a by-pass around the exchanger is used as indicated in Piping Arrangement "A". In this case thermostat T-1 in the hot oil line controls valve V-1. This arrangement permits part of the water to pass through the exchanger under partial load conditions and the balance of the water is by-passed around the cooler. When water consumption is of importance, piping arrangement "B" is recommended. In this arrangement switch S-1 is employed to stop the water circulating pump motor when the 2-way valve V-1 closes tightly. When the valve begins to open the switch starts the pump motor.

Where bath temperatures in excess of 165F are used, a 3-way modulating or throttling type valve should be installed at the point where the oil by-pass line joins the main oil line. This valve is controlled by a thermostat in the oil supply line to the shell and tube heat exchanger.

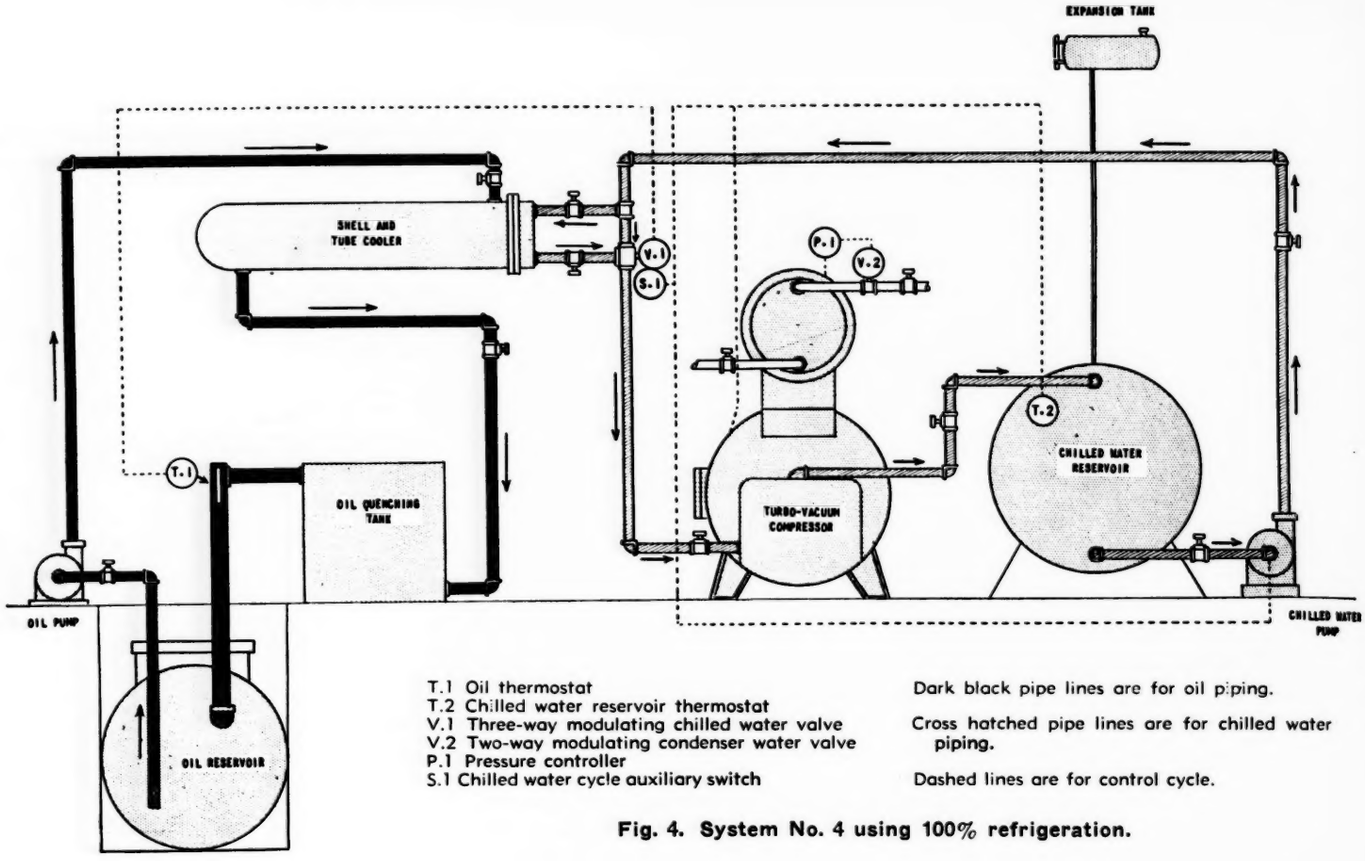
Supplemented Evaporative Cooler

For lower quenching bath temperatures which range from approximately 90F to 100F, it is possible to use a combination of refrigeration and evaporative cooling. Such a system is indicated in Fig. 3. In this method the oil circulating pump delivers the oil first to the evaporative cooler, then to the shell and tube heat exchanger and finally back to the quench tank. Initial cooling is accomplished in the evaporative cooler and the final temperature is attained in the heat exchanger. The exchanger derives its cooling power through the circulation of chilled water which has been



T.1 Oil thermostat
T.2 Chilled water reservoir thermostat
T.3 Spray water thermostat
V.1 Three-way modulating chilled water valve
V.2 Two-way modulating condenser water valve
P.1 Pressure controller
D.M.1 Modulating damper motor
D.1 Air discharge damper
D.2 Air intake damper
D.3 Air recirculating damper
S.1 Damper motor auxiliary switch
S.2 Three-way valve auxiliary switch
Dark black pipe lines are for oil piping.
Dashed lines are for control cycle.
Cross hatched pipe lines are for chilled water piping.

Fig. 3. System No. 3 using evaporative coolers supplemented by refrigeration and heat exchangers.



T.1 Oil thermostat
T.2 Chilled water reservoir thermostat
V.1 Three-way modulating chilled water valve
V.2 Two-way modulating condenser water valve
P.1 Pressure controller
S.1 Chilled water cycle auxiliary switch

Dark black pipe lines are for oil piping.

Cross hatched pipe lines are for chilled water piping.

Dashed lines are for control cycle.

Fig. 4. System No. 4 using 100% refrigeration.

brought to a low temperature through the action of the turbo-vacuum compressor.

This arrangement is utilized principally in operations that require low bath temperatures. Therefore, it is unlikely that the oil leaving the quench tank will be above 165F and, consequently, the necessity of providing a by-pass arrangement is eliminated.

This system may be modified by replacing the evaporative cooler with an additional shell and tube heat exchanger using tap water as its source of cooling. Generally, economics will govern the adoption of such a modification and, therefore, its selection lies in the discretion of the engineer laying out the job.

Automatic Control for System No. 3

Under full load conditions the 3-way modulating water valve V-1 is positioned to allow the full water quantity to pass through the heat exchanger, and fresh air and exhaust dampers D-2 and D-1 are maintained fully open by the modulating damper motor DM-1. As the load is reduced, thermostat T-1 in the hot oil line from the quench tank actuates valve V-1 so that more and more water is by-passed around the exchanger. After the valve is positioned so that all the chilled water is by-passing the exchanger, the damper motor DM-1 begins to close dampers D-1 and D-2 and open damper D-3 so that a greater quantity of recirculated air passes over the evaporative cooler coil. When dampers D-1 and D-2 have become completely closed, switch S-1 shuts down the evaporative unit fan and spray pump motor.

To prevent damper motor DM-1 from admitting sufficient fresh air to cause freeze-up of the spray water, a limit control, thermostat T-3, is located in the spray water tank.

Turbo-vacuum compressor operation is controlled by the chilled water reservoir thermostat T-2. This thermostat is actuated by changes in temperature of the water in the reservoir. Control of the chilled water circulating pump is accomplished by both the operation of the compressor and the position of valve V-1. The pump is brought into operation whenever the compressor starts or whenever valve V-1 is positioned to direct even a small quantity of water through the heat exchanger. In the latter case valve V-1 actuates switch S-2 which in turn starts the chilled water pump.

Pressure controller P-1, which is subject to condensing pressures, regulates the 2-way modulating condenser water valve V-2, and this in turn controls the condenser water for the turbo-vacuum compressor.

If the oil thermostat T-1 is located in the hot oil line from the quench tank, the oil circulating pump motor should be permitted to operate without interruption. However, if the thermostat is placed in the quench tank, the pump may be shut down when the fresh air damper of the evaporative cooler is closed and the 3-way chilled water valve is simultaneously by-passing all chilled water around the shell and tube cooler.

When possible, provision should be made for completely closing the fresh air and exhaust dampers of the evaporative cooler when power failure occurs.

100% Refrigeration

Where low bath temperatures are desirable and the cooling load involved is relatively light, a system util-

izing a shell and tube heat exchanger and chilled water is recommended. This system is shown in Fig. 4.

By means of a circulating pump the hot oil from the quench tank is circulated through the shell side of the heat exchanger and returned to the quench tank. The cooling effected in the exchanger is accomplished by circulating chilled water through the tubes. To insure continuous circulation of full water volume, a by-pass arrangement similar to piping arrangement "A" in System No. 2 is installed in the water line of the exchanger. Since this system is designed to maintain low bath temperatures, it is unlikely that the hot oil leaving the quench tank will ever exceed 165F. Therefore, it is unnecessary to by-pass any oil around the exchanger.

Automatic Control for System No. 4

In order to control the amount of water passing through the shell and tube cooler, the operation of the 3-way modulating chilled water valve V-1 is controlled by oil thermostat T-1. Thermostat T-2 is located in the chilled water reservoir and controls the turbo-vacuum compressor operation to maintain the water in the reservoir within predetermined limits.

When either the compressor is in operation or valve V-1 is so positioned to permit chilled water to circulate through the heat exchanger, the chilled water circulating pump is operated. The effect of valve V-1 on the chilled water circulating pump is obtained through the action of the auxiliary switch S-1.

If the oil thermostat is located in the hot oil line, it becomes necessary to operate the oil circulating pump at all times. Installing the thermostat in the quenching tank permits intermittent operation of the pump.

The 2-way modulating condenser water valve V-2 controls the amount of condenser water supplied to the compressor. This valve is activated by the pressure controller P-1 which is subject to condensing pressures.

Oil Preheating

After periods of system shut-down the oil in the quenching tank can be heated to desired operating temperatures through the use of oil preheating equipment. Suggested procedures for accomplishing such preheating are as follows:

In System No. 1 the oil can be heated to operating temperature by installing a 1-row or 2-row steam heating coil in the recirculated air duct of the evaporative cooler. Selection of the 1-row or 2-row coil depends upon the speed at which the oil must be raised to operating temperature. During the preheating period, the unit fans and oil circulating pump are in operation, steam is supplied to the heating coil, the spray water pump is shut down, the fresh air and exhaust air dampers are closed and the recirculated air damper is open. The preheating cycle can be controlled either manually or automatically.

In System No. 2 two possibilities exist for preheating the oil. The first method requires a second shell and tube heat exchanger which derives its heating effect from either steam or hot water. The oil lines of this second exchanger should be connected in parallel with the oil lines of the original exchanger. This arrangement will allow the second exchanger to be "cut out" of the system during periods of cooling and thereby reduce the pressure drop through the system. The second method utilizes one exchanger for both cooling and reheating. In this case the exchanger must be so designed that it will be suitable for both the heating and cooling media, and the piping arrangement must be such that changes between the heating and cooling sources can be readily made. Again, either manual or automatic control may be provided.

In System No. 3, where oil preheating is necessary, the arrangement and control of the evaporative cooler is identical to that employed when the evaporative cooler is used alone. Further, the 3-way valve controlling the chilled water should be by-passing all water around the heat exchanger. All the above functions must occur simultaneously and control may be either manual or automatic.

Where preheating is desired in the 100% refrigeration system, it is recommended that either an additional heat exchanger be used or a dual purpose exchanger be installed in the oil circuit. Arrangement and control will be identical to that described for oil preheating with System No. 2.

Technical Information

Generally the average values of the specific heat and specific gravity of quenching oils may be assumed as 0.5 Btu per (lb) (F) and 0.88, respectively. Viscosities will vary depending on the type of oil used and the manufacturer. Values of viscosities of some quenching oils are as follows:

Kind of Oil	*Viscosity Saybolt Universal Seconds at 100F*
Houghton No. 2 Soluble Quenching Oil	100
Standard Quenching Oil	100
Superla	240
Esso "Forum 40"	107
Sun Quenching Oil Light	100
Phillips "Thetis Quenching Oil 4004 Medium"	150 — 165
Phillips "Thetis Quenching Oil 4006 Heavy"	200 — 215
Texaco "522 Quenching Oil"	99
Socony-Vacuum Sava Quench M	106
Socony-Vacuum Sava Quench D	105
Socony-Vacuum Sava Quench A	125
Socony-Vacuum Quenching Oil V	159

The values of specific gravity, specific heat and viscosity should be checked on each design and calculations should be based on the properties of the particular oil involved. Data on quenching oil can be secured from any of the oil companies manufacturing such products.

Determination of Loads

Before quenching, the steel is heated to a temperature of 1450F or higher. For purposes of load de-

termination, it is generally assumed that the temperature of the metal drops to a figure approximately 25 degrees higher than the bath temperature.

The cooling load imposed on the oil can be calculated as follows:

$$\text{Load} = W \times C\ (t_2 - t_1)$$

where:

W = pounds of steel quenched per hour.
C = average specific heat of the steel.*
t_2 = temperature to which steel is heated before quenching.
t_1 = temperature of the steel leaving the bath.

The required oil quantity to be circulated can be calculated by the following formula:

Oil quantity in gpm =

$$\frac{Q}{(t_e - t_1) \times 500 \times \text{Sp. Ht.} \times \text{Sp. Gr.}}$$

where:

Q = Load in Btu per hour.
t_e = temperature of oil entering the cooling equipment.
t_1 = temperature of oil leaving the cooling equipment.
500 = a constant used to convert gallons per minute of water to pounds per hour of water.
Sp. Ht. = average specific heat of the oil.
Sp. Gr. = average specific gravity of the oil.

Once the quantity of oil to be circulated is known and the temperature limits of the oil established, the proper sizing of equipment becomes a basic heat transfer problem, solution of which depends to a great extent upon the selection of equipment offered by various manufacturers.

*The specific heat of steel varies with changes in temperature. However, over the range of cooling and quenching applications, an average specific heat of 0.16 Btu per (lb) (F) may be used.

Radiant Heating for Greenhouses

Radiant heating in greenhouses through pipe coils installed in the concrete floor of a greenhouse, or in the soil itself, is said to maintain a uniformly warm root system while the air is kept at a temperature required for healthy growth. Radiant heating is seen as a means of combating mildew and disease and of increasing the vigor and stamina of plants.

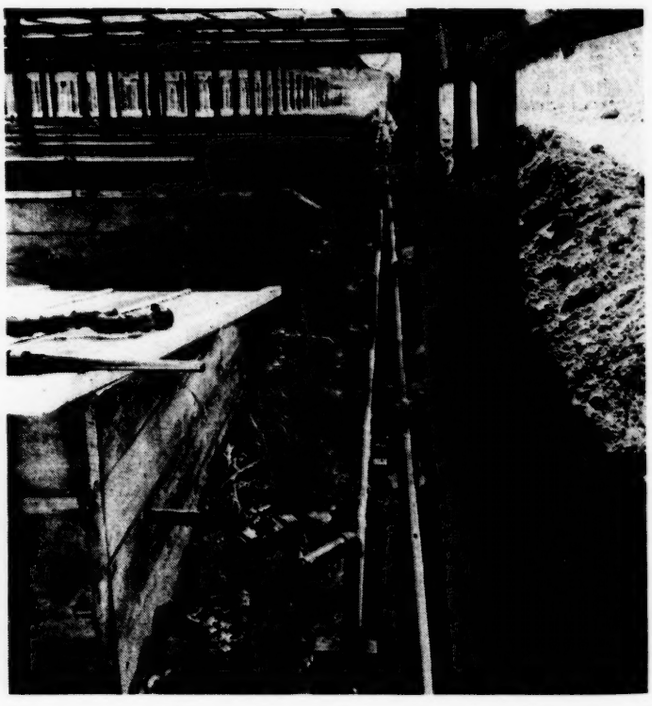
One of the few such systems in operation in the country is that recently installed in the "dream greenhouse" of Donald A. Dickerson, at Bloomingdale, Michigan. Mr. Dickerson's building is 62 ft by 312 ft and he has placed 1¼-inch wrought iron heating pipe on 12-inch centers in four zones. The floor construction consists of crushed stone to a depth of 8 inches in which the pipes are buried near the top. Over the stone and pipe is a 2-inch concrete slab.

After his first winter of operation, Mr. Dickerson reports that results have convinced him that radiant heating cannot be excelled for growing plants. He said that it is ideal for growing crops from bulbs.

At Semmes, Alabama, Owen Blackwell, owner of the Blackwell Nurseries, has installed a radiant heating system of wrought iron pipe in his azalea beds, which contain more than a million plants. The heating pipe has been laid directly in the ground.

The nurseries have 35 azalea beds to a section, each bed being 48 feet long and 6 feet wide. The boiler is situated in the geometric center of the plot, with a two-inch black wrought iron line running around the perimeter of the plot, serving as the hot water supply line.

This line is in a dirt trench about 10 inches underground. Each individual bed has a run of 1¼-inch wrought iron pipe attached to a plank forming the perimeter of the bed. The center line of flow of water



Pipe lines extend the length of the Blackwell Nurseries as part of a radiant heating system installed in azalea beds. Heat from the hot water circulated through the system warms the earth and stimulates the plant growth.

is about 6 inches above ground. Hotbed sashes are placed over the wooden planks. The temperature is kept at a minimum of 40F.

Similar adaptations of radiant heating to greenhouses are in operation in other parts of the country and the enthusiastic indorsement of the systems by greenhouse owners indicates that many more will be installed in the near future.

Something New Under The Stars

Air Conditioned Drive-in Theaters

CARL F. BOESTER

NOW that it is well established that drive-in theaters are sound economic ventures, it becomes more apparent that additional capital investments for such plants are exceedingly well worthwhile. Rather careful engineering analysis indicates quite decidedly the feasibility of providing air conditioning for the comfort of drive-in patrons. More operators would be indeed surprised and some quite skeptical that it is possible to air condition outdoor movies. It not only is possible but it is an excellent means of extending the season and substantially increasing the revenue.

By air conditioning we mean providing not only cooled, dehumidified and filtered air for summer comfort but heated and filtered air for winter comfort. The means of accomplishing the air conditioning for drive-ins is, from an engineering viewpoint, rather simple. An insulated underground pipe system is in-

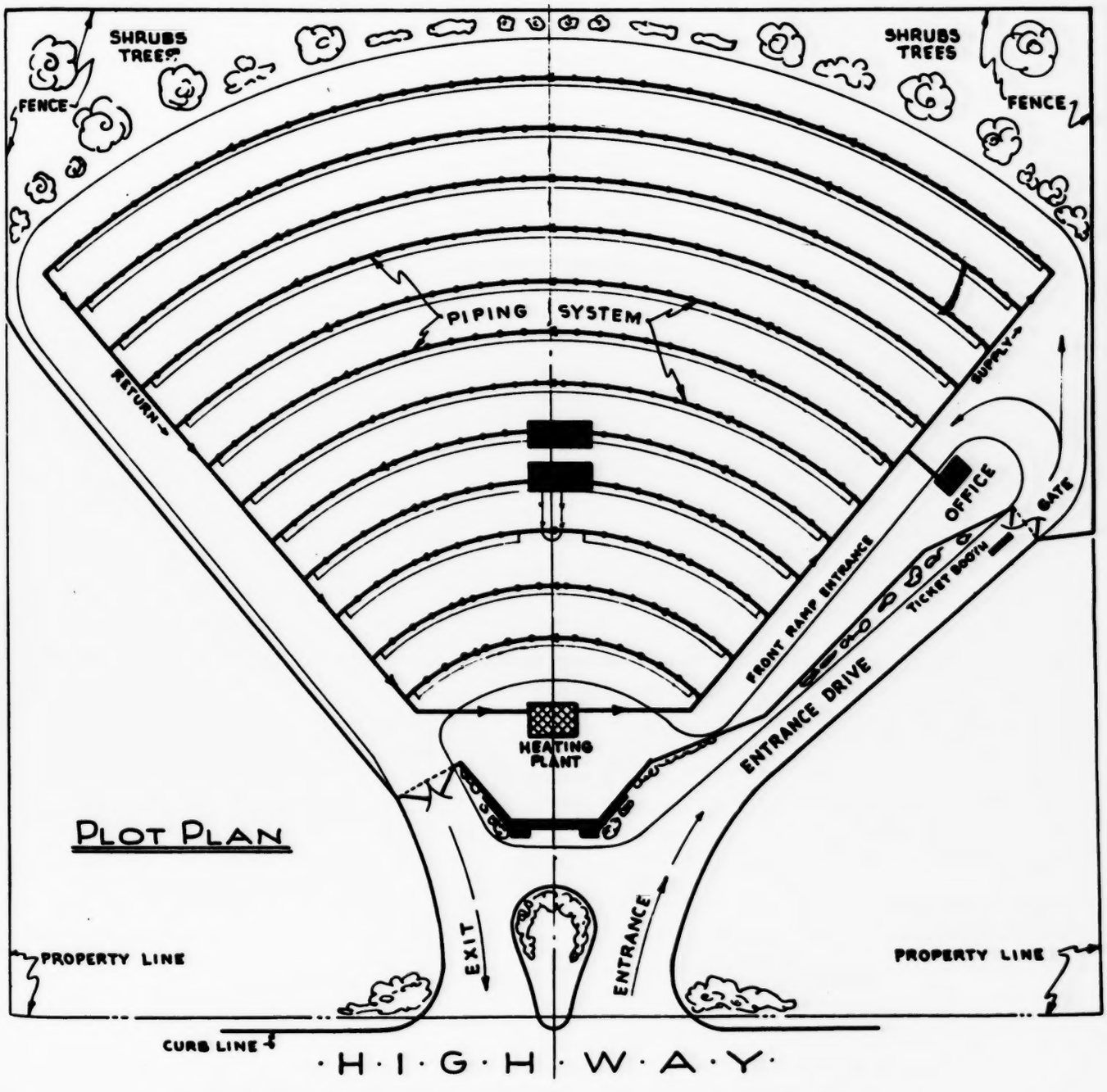


Fig. 1. Plan of drive-in theater and piping system for heating and cooling.

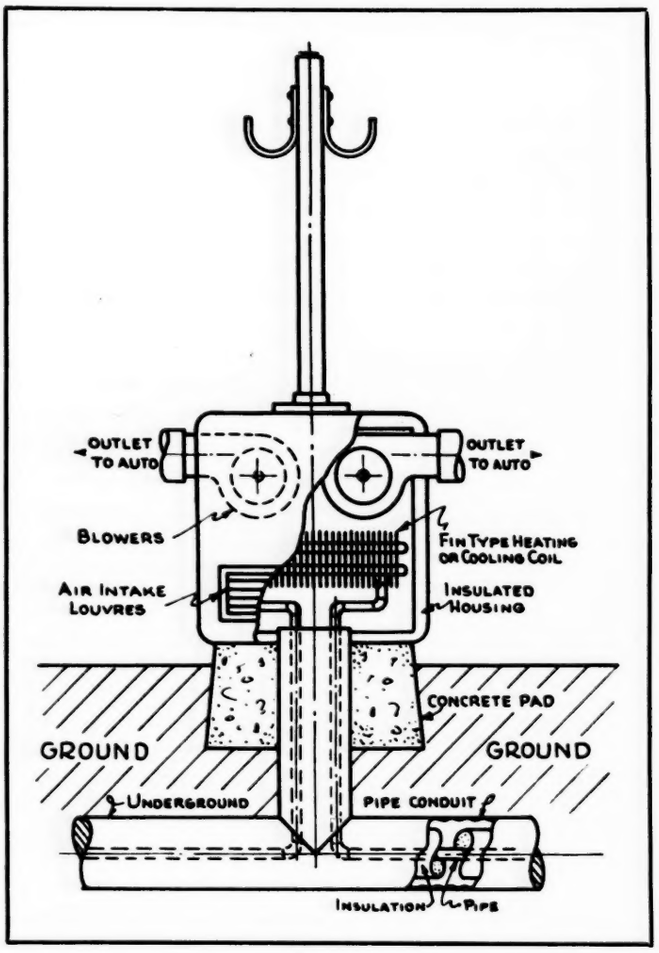


Fig. 2. Detail of heating or cooling unit for each parking station.

stalled under the entire parking area. A typical piping layout is indicated by Fig. 1. At each parking station there is installed at the base of the speaker post a small coil and blower unit not much unlike the ordinary automobile heater except for differences in capacity. Connected to this coil and blower unit is a flexible tube which discharges the conditioned air into the automobile; 100% outside air is used and therefore it is fresh. The air is, of course, filtered. This conditioned air is discharged into the car and is exhausted by opening a window very slightly on the opposite side of the car. The assembly of the equipment located at each parking station looks somewhat like the illustration in Fig. 2.

In summer, chilled water is piped through the piping system to each one of the coil and blower units at each parking station. This permits the cooling and dehumidifying of the air circulated to each automobile. Since the automobiles have closed windows there is no annoyance from dust, mosquitos, or the commotion of adjacent cars. Likewise, patrons can smoke as much as they wish without annoying other occupants because of a constant supply of fresh air and the exhausting of smoke-laden air.

In the winter, hot water is circulated through the underground piping system to the various parking stations so that heated air can be blown into the cars from the coil and blower unit at each parking station.

Water is heated by circulating it through a hot water boiler using stoker-fired coal, oil or gas for fuel, whichever is available in unlimited supply, at the least cost.

Heating plant, shown directly in front of elevated screen on plot plan, may be relocated to fit the project. For convenience and economy, the structure may be incorporated in the manager's office building.

Summertime, chilled water is provided the parking stations from a large capacity storage tank in which is submerged an appropriate system of refrigeration pipe coils. These coils are connected to a small refrigeration machine which operates 24 hours a day producing and storing sufficient ice and chilled water in the tank to handle the evening cooling load. This is the old familiar storage refrigeration principle which permits the very minimum of cost for refrigeration equipment to provide the necessary chilled water.

An economy of operation is effected, since heating and cooling is provided only for the cars that are actually in the parking area. In enclosed buildings it is necessary to cool the entire theatre regardless of the number of patrons. It is not so in this particular instance, therefore the economy of operation becomes rather obvious.

While it would be highly desirable to give the reader some information concerning the cost of such a system per parking station, it is not possible to do so at this time. Since the plan is only under way, estimating installation costs will vary widely, depending on the drive-in layout because it affects the amount and size of pipe required. Again, the cost of installation might be affected by soils which are extremely difficult to excavate, and on occasion rock may be encountered. Nevertheless, very careful estimates for such systems indicate not only their feasibility but indicate such systems are imperative from the viewpoint of materially increasing not only the patronage but the number of weeks per year you can operate.

None of the ideas or equipment suggested has been restricted by patents. Operators and engineers are invited to try out the system described.

Pneumatic Feeder Developed for Pulverized Coal Gasification

By a new method of coal feeding, announced by the Bureau of Mines, pulverized coal is made to flow like water through a pipe to a generator producing the synthesis gas required for the manufacture of synthetic liquid fuels.

Developed by the Bureau's Synthesis Gas Production Laboratories at Morgantown, W. Va., this device works on a principle involving a bed of finely powdered coal agitated to a "boil" by an air current so that it can be fed into the generator at a constant instantaneous rate, which is unattainable with mechanical feeders, laboratory technicians found. With this new feeder, the quantity of coal that can be conveyed by one cubic foot of air is about 30 times that previously obtained.

Production and Prices of Steel Pipe

The Construction Division of the Department of Commerce has prepared a special report on production, uses, and prices of steel pipe. Following is an abstract of the Division report.

GENERALLY ranked with plate, sheet and strip in current lists of "still-hard-to-get" steel products, steel pipe usually has accounted for some 10% of annual steel product output during the past several decades. To some extent, the reasons for recent steel pipe supply deficiencies seem to be attributable to the versatility of the product itself. In addition to construction, major consumers of steel pipe include the closely related oil and gas industries, the railroad industry, the automotive and the machinery industries, the chemical and food processing industries, and many others. To fulfill the requirements of these and other consumers, the steel pipe industries in 1948 produced over 7 million tons of pipe (prewar high, 5.7 million tons in 1941); value of 1948 output is estimated to be in the neighborhood of $1 billion.

In building construction, steel pipe is used as part of the building structure itself and in its plumbing, heating, and utilities installations. In other types of construction, steel pipe plays an especially important role in the construction of oil and natural gas pipelines and is widely used for major city water mains and water transmission lines. Interior heating and water piping within buildings, scaffolding, railings, electrical conduit, telephone, telegraph and lighting poles, and piling of steel pipe filled with concrete are notable examples of specific uses of steel pipe in construction.

In other industrial spheres, substantial tonnages of steel pipe and tubing are consumed annually in the manufacture of automobiles, freight cars, machinery and furniture components, in pressure tubes for cracking stills, locomotive, marine and stationary boilers, in casing, tubing and drill pipe for oil and gas well drilling, in the fabrication of flagpoles, trolley poles, and ships' masts and for naval and military uses.

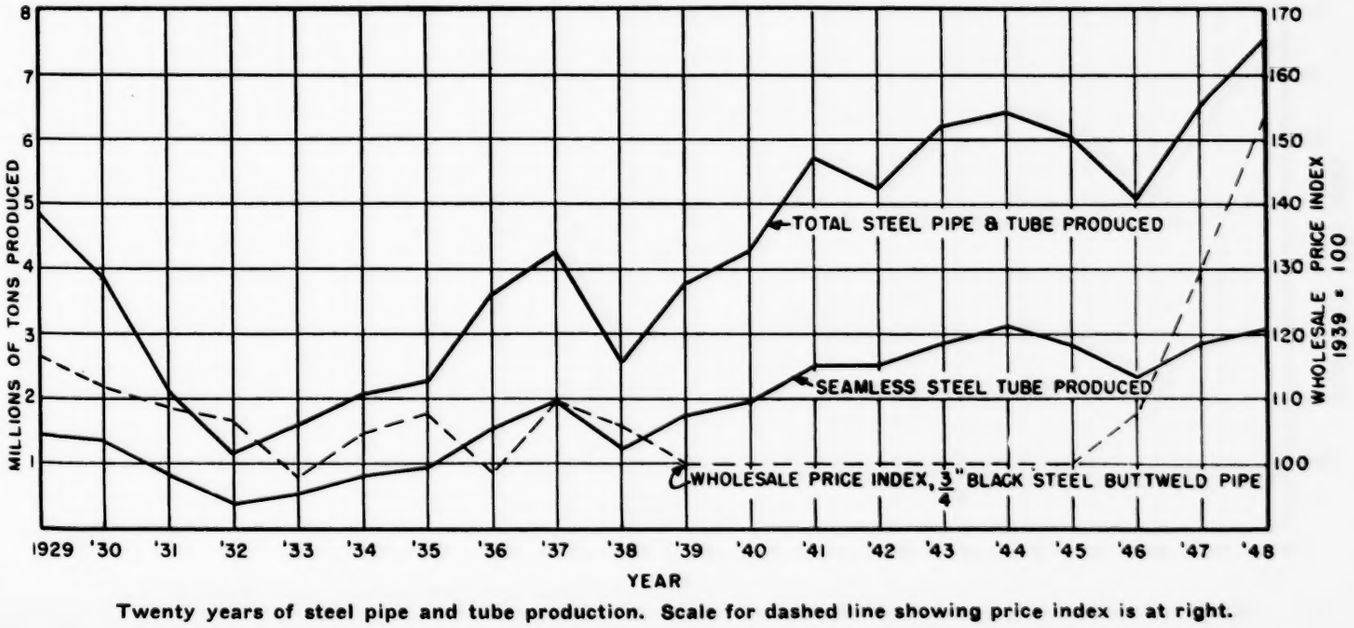
Distribution

American Iron and Steel Institute figures indicate that, except for the war years, approximately half of total steel pipe production has been distributed through jobbers, dealers, and distributors. A substantial proportion of this tonnage, in all probability, ultimately finds its way into some form of construction activity.

In addition, some 15 to 20% of the annual output volume of steel pipe producers is shipped directly to the construction industry, mostly for pipeline construction. "Contractors' products" (plumbing, heating, air conditioning, and ventilating equipment) generally absorb another 2% of annual output. In all, it would appear that construction, including pipeline construction, by both direct and indirect purchases, probably absorbs from one-third to more than half of total steel pipe output—the exact proportion in any period varying with the ups and downs of the construction cycle.

The use of wrought iron pipe—forerunner of steel piping—became increasingly popular in Europe and the United States after the Napoleonic wars. In 1825, an English inventor introduced a method of producing wrought iron pipe which, with some improvements, still forms the basis of a not insignificant share of the production of wrought iron and steel pipe today.

Once in commercial production, output of steel pipe expanded rapidly. By 1890, it was estimated that steel pipe production accounted for some 5% of total wrought pipe (wrought iron and steel) output. Forty years later, by 1930, this proportion had been more than reversed, with steel pipe accounting for an estimated 96% of total wrought pipe output in that year.


MILLIONS OF TONS PRODUCED
WHOLESALE PRICE INDEX 1939 = 100
TOTAL STEEL PIPE & TUBE PRODUCED
SEAMLESS STEEL TUBE PRODUCED
WHOLESALE PRICE INDEX, 3/4" BLACK STEEL BUTTWELD PIPE
YEAR
1929 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48

Twenty years of steel pipe and tube production. Scale for dashed line showing price index is at right.

Under present day manufacturing practices, all steel pipe is produced in one of two basic forms; welded and seamless. To produce welded pipe, flat rolled steel strip or plate is bent into tubular form, and the edges then joined and welded together by one of several different methods. The strip or plate is known in the industry as "skelp". Seamless steel pipe, on the other hand, is usually produced by piercing or hollowing out a round, solid steel bar. Open-hearth, bessemer and electric furnace steels may be used for the manufacture of both welded and seamless pipe.

Although production practices vary to some extent from plant to plant, most welded steel pipe produced today may be classified in one of five manufacturing-process categories; buttweld, lapweld, electricweld, gasweld and spiralweld.

Since 1934, between 40 and 50% of all steel pipe output has been produced in seamless form.

The Industry Production Record

Few figures are available to trace the year-by-year growth of steel pipe production from the establishment of the industry in 1887 until 1913, when the American Iron and Steel Institute began to publish data on annual production of steel pipe comparable with those compiled at the present time. In that pre-World War I year, production already had surpassed the 2½ million net ton mark, some 95% of that total produced by the butt and lapweld processes, the remaining 5% being seamless pipe. By 1916, production topped the 3 million ton mark, and—after slight declines extending from 1917 through 1919—reached almost 3.7 million tons in 1920. By 1929, total production (now 30% seamless) reached 4.8 million tons, a record which stood until 1941.

After a 4.3 million ton production level in 1940, output in 1941 surged past 5 million tons for the first time, setting a prewar record of 5.7 million tons. Heavy military requirements for steel pipe during the war helped push production levels still further upward—to 6.2 million tons in 1943 and to a then-record 6.4 million in 1944. A slight decline to 6 million tons was recorded in the end-of-the-war year of 1945.

Outlook for 1949

Steel pipe production during 1949 is not expected to be much above the 7.5 million ton mark, a total which seems to be approaching the upper range of the industry's current practical working capacity. Although the American Iron and Steel Institute's recent capacity study indicates an industry production potential of 8,779,000 tons, full utilization of this potential appears limited by the fact that capacity for the production of skelp and pierced billets combined totals only 7,691,000 tons. Even if facilities for the production of steel plate, which may be converted to large diameter pipe without being first classified as skelp, were added to these figures, pipe output probably could not readily exeeed 8 million tons. An annual pipe output above this level with present production facilities would presuppose no restriction on quantities of steel ingots available for ultimate conversion to pipe. Today's steel supply situation, however, while somewhat beclouded by recent developments, may still require continued careful voluntary rationing of available ingot supply between pipe and other product classifications to achieve a balanced product mix, and may further limit prospects of exceeding an 8 million ton pipe output figure during 1949.

Postwar Price Trends

The sharp postwar increases in consumer demand for steel pipe (as well as the rise in the general price level) have apparently been accompanied by a steady upward movement in steel pipe prices through the end of 1948. While complete data are not available on price movements among the full range of pipe products manufactured by the industry, such partial data as are available indicate that steel pipe prices during 1948 were, on the average, 53% higher than at the end of the war.

Percentage-wise, this increase (gaged on the basis of Bureau of Labor Statistics Wholesale Price Indexes for one type of buttweld piping) was approximately the same as the increases reported by the Bureau in prices of all commodities and of all iron and steel materials during the same period. Measured against prewar price levels, however, steel pipe apparently has shown the smallest increase of the three commodity classifications. Between 1939 and 1948, average prices of all commodities have increased 114%, those of all iron and steel materials 62%, while prices of this type of buttweld piping have increased 53%.

While price changes in this one type of pipe (for which complete historical information in BLS Price Index form is available back to 1913) are not necessarily typical of price movements for all steel pipe, it seems probable that they are broadly indicative of the magnitude and direction of major price fluctuations.

District Heating Favored in Boston

Owners and planners of large office and business buildings in Boston favor the use of district heating, according to Thomas H. Carens, vice president of the Boston Edison Co. Speaking at a panel discussion of the National District Heating Association, at the New Ocean House, Swampscott, Mass., Mr. Carens declared that the continued growth of this type of business has now limited its further expansion in Boston, since the Edison company's steam producing facilities are now taxed to capacity. He said that $2,975,371 of Boston Edison's 1948 income was received from the sale of steam and that a peak load off 1,000,000 pounds of steam per hour was reached in Boston last December (during a fairly open winter). Boston's 28-story John Hancock Building will be supplied with steam next season by Boston Edison.

Average Solar Radiation in the United States

SIGMUND FRITZ and TORRENCE H. MacDONALD
U. S. Weather Bureau

Average daily amounts of solar radiation, Q, received on a unit horizontal surface over the United States for each month are presented in the form of isolines on maps. The relationship of Q to cloudless day radiation and percent of possible sunshine is given as a linear equation; this is followed by a discussion of use of the equation to supplement values of Q obtained by direct measurement.

IN view of the need for solar radiation data on the part of engineers, meteorologists, and others, previous computations which applied to cloudless days only [1] have been extended to include the solar radiation received on a horizontal surface over the United States for the average of all days, for each month. As in the case for cloudless days, charts based on the computations serve to extend Kimball's [2] 1919 charts to the West Coast and to modify his work by utilizing the mass of radiation data which has been accumulated since then.

To facilitate the discussion it is necessary to define the following quantities which are *normals* or *long-time averages* for a given station and month:

Q: Amount of solar energy received on a square centimeter of horizontal plane at the earth's surface per day expressed in ly per day. (One "ly", abbreviation for "langley", is one gram calorie per square centimeter. To obtain the number of Btu per square foot, multiply the number of ly by 3.69). This includes all days regardless of degree of cloudiness.

Q_o: Cloudless day radiation. Amount of solar energy received on a square centimeter of horizontal plane at the earth's surface per day *during cloudless days;* expressed in ly per day.

S: Number of hours of sunshine instrumentally recorded divided by the number of hours of possible sunshine.

The basic solar radiation data were obtained from continuously recording pyrheliometers at the following eleven stations: Blue Hill, Massachusetts; Newport, Rhode Island; Madison, Wisconsin; Twin Falls, Idaho; Washington, D. C.; Lincoln, Nebraska; Fresno, California; Riverside, California; New Orleans, Louisiana; La Jolla, California; and Miami, Florida. The locations of these stations are shown in Fig. 2. There were at least ten years of data for each station.

Relation Between Q/Q_o and S

Obviously, it would be difficult to draw isolines of radiation, Q, on a map of the United States merely on the basis of the data from these eleven stations. It was therefore necessary to estimate the radiation at many other stations. It has been suggested by others [3], [4], and [5] that Q can be determined from the relationship

$$Q = Q_o (a + b S) \qquad (1)$$

where a and b are constants the sum of which is unity. To test equation (1) and to determine a and b, the ratio Q/Q_o was determined for each month for each of the eleven basic stations, Q being the measured value, and Q_o being obtained from [1]. For each of these months, and for the same period of record as Q, S was obtained from the Weather Bureau files, either on the basis of actual measurements or by interpolation from charts having isolines of S [6]. Fig. 1 is a scatter diagram of these values of Q/Q_o against S. The corresponding linear equation, obtained by the method of "least squares", is

$$Q/Q_o = .35 + .61 S \qquad (2)$$

The correlation coefficient between Q/Q_o and S is 0.88, and the average error in estimating Q from equation (2) and values of Q_o for these "basic stations" is about 4.5% of the observed value of Q.

It should be emphasized that equation (2) is based on *monthly* averages of Q and S, where S ranged from .35 to .97 only, so extrapolation to $S = 0$ may not be valid. The failure of $a + b$ to equal unity may be explained from this, and also by the fact that radiation

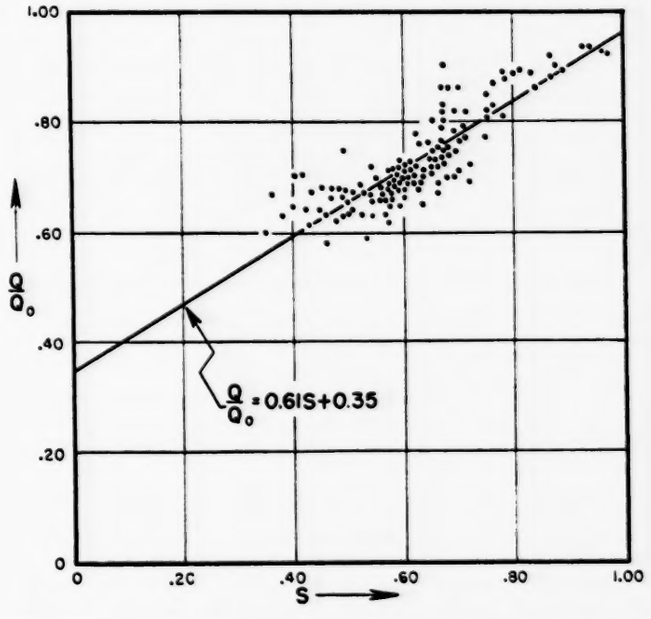


Fig. 1. "S vs Q/Q_o". Relation between sunshine, S, and the ratio of average radiation, Q, to the average cloudless day radiation, Q_o.

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on days when S equals unity is in general slightly different from that on cloudless days, since some cloudiness can exist on days when S equals unity. Kimball [2] used *daily* values of Q and S and obtained a nonlinear curve. On the basis of relatively few data from Madison, Lincoln, and Washington, he assumed that a straight line connecting the points $S = 0$ and $S = 1.00$ on his curve would fit *monthly* data. The linear equation corresponding to this straight line gives $a = .22$ and $b = .78$. Analysis of the data indicates that the main reasons for the difference between Kimball's equation and equation (2) are the inclusion of more data in the latter, especially from Western stations, and the difference in definition of Q_o. Kimball's use of daily values (as opposed to monthly averages on which equation (2) is based) may also have contributed to the difference.

Variations in the value of these constants cited by the several investigators ([3], [4], [5]) are probably due primarily to (1) difference in the physical character and distribution of clouds investigated; (2) differences in the definitions of, and methods of measuring, Q, Q_o, and S; and (3) differences in the statistical handling of data.

Calculation of Q from Equation (2)

Equation (2) can be applied to any place in the United States for which values of Q_o and S are available. To obtain Q, equation (2) was applied to 150 sunshine stations where S is measured, and for which Q_o was obtained from the charts [1]. Values of S, averaged at each station for the period 1923-47, were obtained from Weather Bureau files.

It is obvious from the scatter of the points in Fig. 1 that the equation does not give the observed values of Q exactly, and, therefore, at points where Q was not measured, it was necessary to correct the computed values so that they would be commensurate with measured values of Q at neighboring stations. For clarity, let Q_r be the measured value of Q for the period of record, and S_r the corresponding value of S. Also, let $f(S_r)$ be the value of Q computed by substituting S_r into equation (2). Then, in general, Q_r does not exactly equal $f(S_r)$. The difference d is given by $d = Q_r - f(S_r)$. Values of d for the eleven basic stations were plotted on a map of the United States for each month and isolines of d were drawn in regions where it appeared that a systematic geographic distribution existed. It is reasonable to suppose that at points where Q is not measured in these regions of systematic distribution but computed from S and Q_o, the computations are in error by an amount approximately equal to the values given by isolines of d. Therefore, on the basis of the isolines, corrections were applied to the values of Q previously computed for the 150 sunshine stations. This correction was not large and, except for a few cases, was considerably less than 10% of the radiation value. In a few cases a correction was made to data observed at the radiation stations to account for the fact that S_r was different from S for the period 1923-47. These corrections did not exceed in any case 4% of Q_r. The final adjusted values of Q were plotted on maps and isolines were drawn. The results, in units of "ly per day", appear in Fig. 2, where the data of the

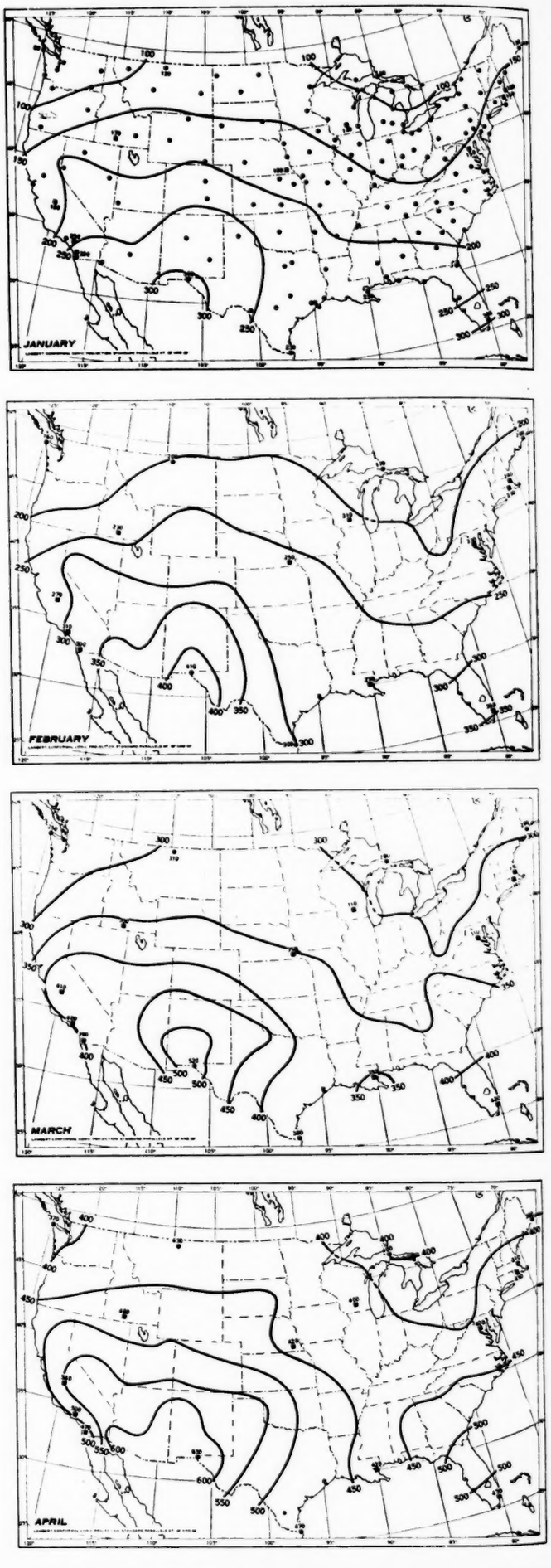
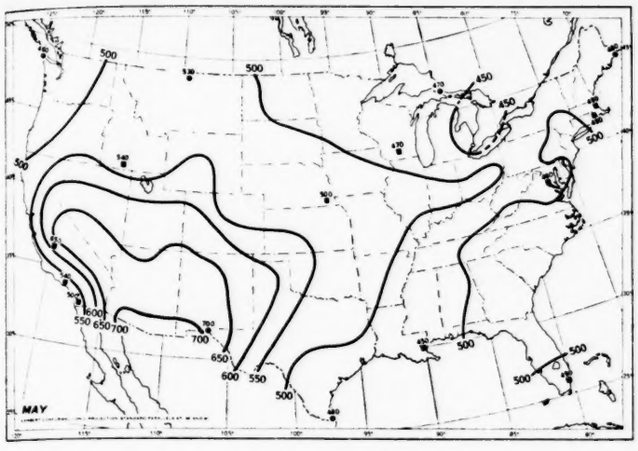
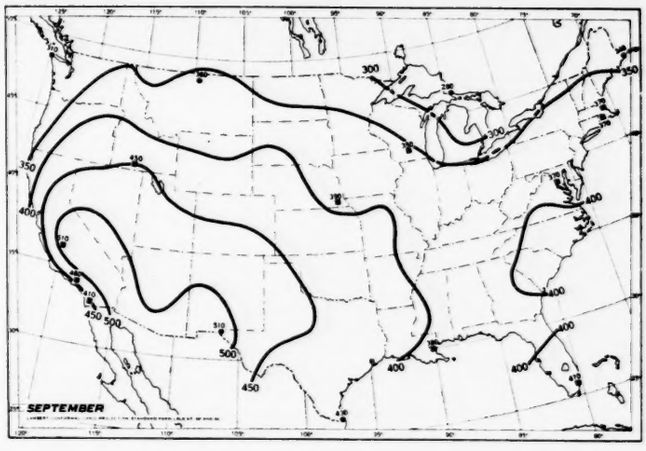
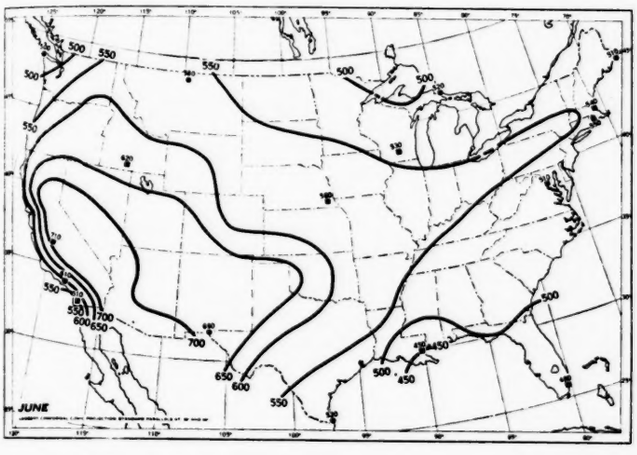
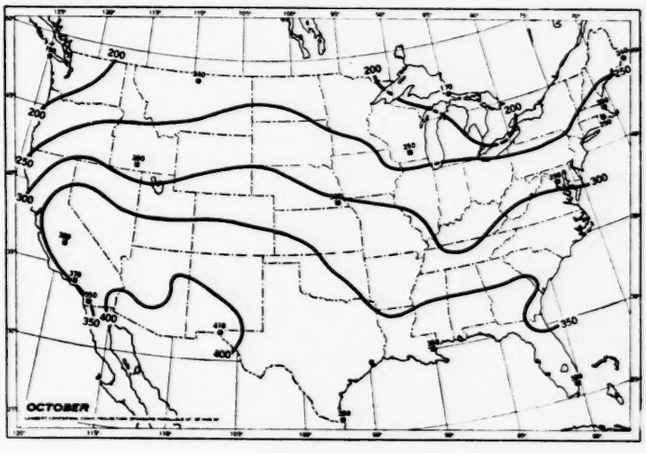


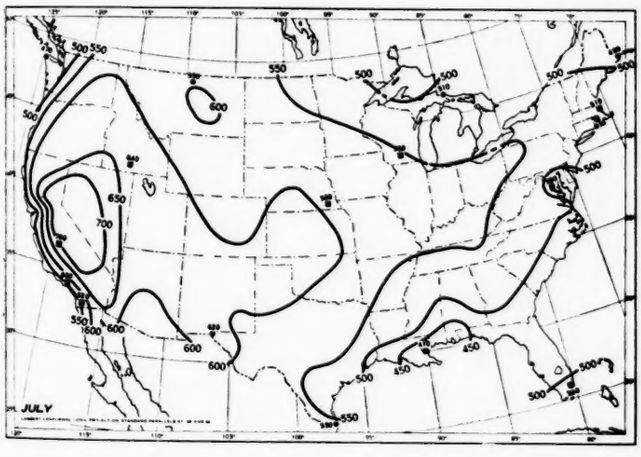
Fig. 2. Average daily solar radiation received on a horizontal surface at the ground (by months) in ly per day. (To

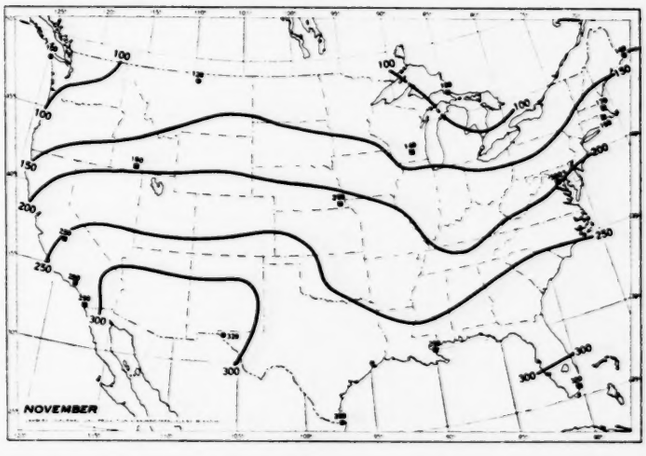


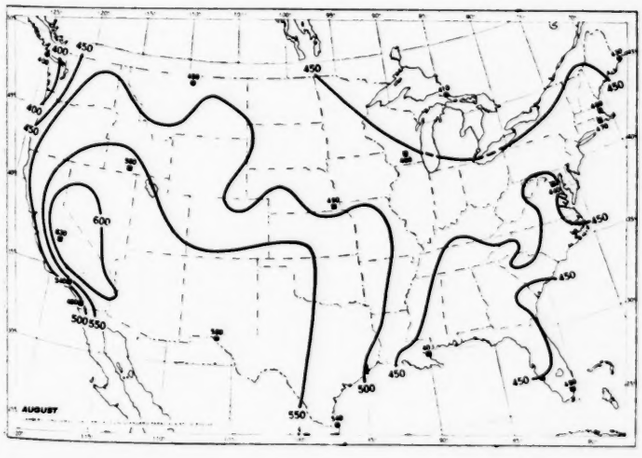


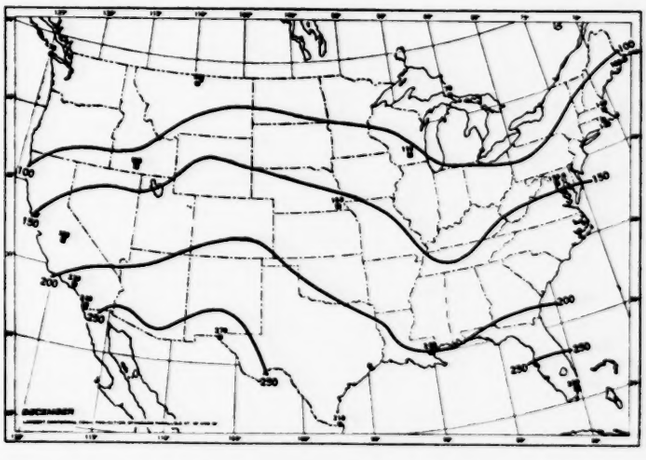












convert to Btu per (sq ft) (day) multiply the number of ly per day by 3.69). Measured radiation (■), computed radiation (●). The locations of all the stations used are given on the January map.

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radiation stations have been given, but only a few of the computed values have been entered to indicate the radiation near the borders of the charts.

Discussion of the Charts

The radiation charts show much the same broad features as the Q_o charts [1]. The radiation values are low during winter (centering on December) when the solar trajectories are low, and high in the months of high solar trajectory, centering on June. In December there is a relatively great change from south to north, while in June there is relatively small latitudinal variation in Q with a weak maximum in the neighborhood of 40 degrees north. The most obvious features of the longitudinal distribution in both winter and summer are relatively low values in the Great Lakes region due to a combination of relatively high cloudiness and important cloudless day radiation losses, and maximum values in the Southwest, except on the immediate Coast, due to a combination of relatively sparse cloud cover and slight cloudless day depletions. In winter the depleting influence of clouds is greater than is the case during summer, since on the average more clouds are present nearly everywhere in winter.

The average error in the basic data (that is, the difference between Q as computed through use of the equation and Q as measured) amounts to about 4.5% of the measured Q. Since the computations for the "sunshine stations" were corrected for d, the expected error in them is of the order of 5% or less. In using the charts at points other than those at which Q is actually computed or measured, there is an additional source of possible error, important in some areas, unimportant in others. This arises from the fact that in some areas there are important local variations in factors influencing Q_o and S, and hence similar important local variations in Q, while in other areas local variations are negligible. The most important factors affecting local variations are atmospheric pollution, elevation, ground reflection, and degree of cloudiness. Thus, Q will have large local variations in large cities, mountainous areas, in regions having abrupt changes in average snow cover, and on the shores of large bodies of water. The isolines are therefore quite reliable in specifying Q for a selected point in the Midwest, for example, and are not so reliable in the Rocky Mountains and on coastal shores.

References

1. Fritz, S., "Solar Radiation on Cloudless Days", HEATING AND VENTILATING, Vol. 46, No. 1, pps. 69-47, January 1949.
2. Kimball, H. H., "Variations in the Total and Luminous Solar Radiation with Geographical Position in the United States", *Monthly Weather Review*, Vol. 47, pps. 769-793, 1919.
3. Kimball, H. H., "Measurements of Solar Radiation Intensity and Determination of the Depletion by the Atmosphere . . .", *Monthly Weather Review*, Vol. 55, pps. 155-169, 1927.
4. Angstrom, A., "Solar and Terrestrial Radiation", *Quarterly Journal of the Royal Meteorological Society*, Vol. 50, pps. 121-126, 1924.
5. Haurwitz, B., "Daytime Radiation at Blue Hill Observatory in 1933 . . . ", Harvard University Press, 1934, *Harvard Meteorological Studies No. 1.*
6. U. S. Weather Bureau, "Average Percentage of Possible Sunshine", *Daily Weather Map.*

Gas Utilities Adopt High Btu Oil Processes

New gas making methods developed under the gas production research program of the American Gas Association are spearheading a trend to high Btu oil processes throughout the gas industry. More than thirty gas utility companies have installed or are negotiating contracts to install flexible, low cost oil processes to help meet peak load demands.

While the majority of the gas utility companies adopting the new gas processes are in the manufactured gas branch of the industry, several mixed gas and natural gas companies are installing high Btu oil gas apparatus as a standby facility for meeting peak loads or as a means of expanding present production and distribution capacity at a minimum cost.

The trend toward use of liquid fuels has intensified during the past year. This has been particularly true as regards the adoption of the Hall process developed under the direction of Edwin L. Hall, director of the AGA Testing Laboratories at Cleveland and Los Angeles. This process proved that low cost, high carbon bunker oils can be used economically for manufacturing high Btu gas. Changes in refinery practices have brought greater supplies of these heavier oils into the market at lower prices. Manufacturers of gas making equipment have further developed the principles uncovered by the AGA Gas Production Research program and found that some low quality, low cost, raw crudes are ideal for gasification. There are prospects for abundant supplies of this material.

The flexibility of the new Hall high Btu oil gas process has recommended its use to meet a wide variety of applications. Thermal capacities of existing plants can be nearly doubled. Through production of gas with higher Btu value the distribution capacity can be greatly increased. Gas utilities in areas awaiting the advent of natural gas have found the production of high Btu oil gas to be an ideal means of economically meeting peak loads until they are served with natural gas.

Gas production research is continuing under the gas industry's coordinated promotion, advertising and research (PAR) plan in the laboratories of the association, in research institutions and in laboratories of gas equipment manufacturers. Use of inexpensive fuels through fluidization methods, gasification of pulverized coal and carbon-oxygen reactions are among the important projects being pursued. Gas utility companies are greatly interested in these projects, looking toward the development of a continuous process for making gas which now has reached the pilot plant stage.

A National Uniform Plumbing Code

PLUMBING research at the National Bureau of Standards—directed at some of the most controversial plumbing problems—has provided certain comprehensive quantitative data required by code-writing authorities in preparing a proposed uniform plumbing code. The Bureau's investigations were conducted in part with full-scale home plumbing systems of transparent plastic pipes, thereby permitting visual and motion-picture studies of the flow conditions. Working in close cooperation with this project are the code-writing authorities which make up the Uniform Plumbing Code Committee. This group consists of representatives of the National Association of Master Plumbers, the United Association of Journeymen and Apprentices of the Plumbing and Pipe-Fitting Industry of United States and Canada, the Housing and Home Finance Agency, the U. S. Public Health Service, and the National Bureau of Standards.

The factors which the Bureau was asked to investigate experimentally were (1) the self-siphonage of the traps used with such fixtures as lavatories, bathtubs, and sinks; (2) the suitability of stack venting of fixtures; and (3) the conditions under which wet venting of fixtures would be satisfactory.

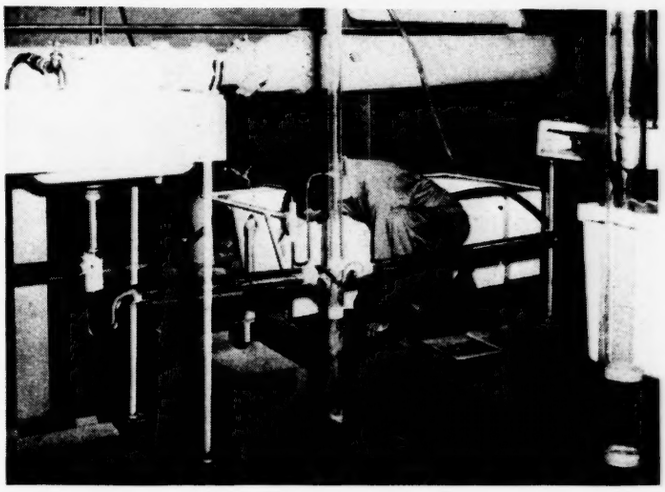
In order to carry out this experimental investigation three typical plumbing drainage systems were constructed in the Hydraulics Laboratory at the National Bureau of Standards. These systems were complete in every detail; each including a stack with horizontal branches or fixture drains, a building drain and building sewer, and a street sewer.

The use of smooth plastic pipes, for the most part, made the test conditions more severe than would have been the case if the conventional metal pipes had been used. However, in order to assure that the test results would be directly applicable to service conditions, most of the tests were duplicated with metal traps, drains and fittings in those portions of the systems in which the pipe material might in any way affect the results.

The investigations of fixture-trap self-siphonage have demonstrated that the slope and diameter of the fixture drain, the various dimensions of the trap, the type of fitting joining the fixture drain to the vent, the rate of discharge from the fixture, and the shape and size of the fixture, as well as the distance between the trap and the vent fitting, all have an important effect on the observed trap-seal losses.

Tests have shown that traps with small internal diameter are more subject to seal losses from self-siphonage than traps having larger internal diameter. Hence a particular cast trap may not yield results even approximating those obtained with a tubing trap.

In like manner, lavatories, as well as other fixtures, are made in a variety of sizes and forms. Tests on the 18- by 20-inch lavatory have shown it to have, under certain conditions, less favorable self-siphonage characteristics, owing to its smaller surface area, than the 20- by 24-inch lavatory. Again, the Bureau investigations have revealed that the use of a short-turn drainage fitting at the end of the fixture drain where the vent connects to the system is, in general, preferable to the use of a long-pattern fitting. In addition the rate of discharge from a fixture, which may be substantially affected by small changes in the size and shape of the outlet orifice, was found to exert an important effect on the results of the self-siphonage tests. This effect is sufficiently pronounced that it can sometimes be observed with fixtures of the same manufacture and model number, identical in every respect, except for small differences in the bevel provided on the outlet orifice to accommodate the rubber stopper.



Full-scale plumbing systems in clear plastic pipe for one- and two-story houses have been erected in the Hydraulics Laboratory of the National Bureau of Standards for tests to clarify plumbing code provisions.

The investigation of the merits of stack venting of plumbing fixtures was made on a single-story system, complete with stack, building drain, building sewer, and street sewer. Fixtures are said to be stack-vented when they are grouped closely around the vertical stack with their drains connecting to the stack with no other venting. The tests made at the Bureau have shown conclusively that under certain conditions stack venting of plumbing fixtures is a satisfactory method of venting.

The third problem investigated with reference to the proper venting of individual plumbing fixtures was the method commonly termed "wet venting." In this method of venting, a portion of the drain of one fixture serves as the vent of another fixture. The specific problem given to the Bureau by the Uniform Plumbing Code Committee and the Housing and Home Finance Agency was to determine the factors affecting the performance of wet-vented traps in one- and two-story drainage systems and to determine under what conditions such venting of one- and two-story drainage systems, with relatively simple restrictions on the fixtures involved and on the sizes of the wet vents, is entirely practicable and that under such circumstances advantage may be taken on the savings afforded by wet venting, as compared with back venting.

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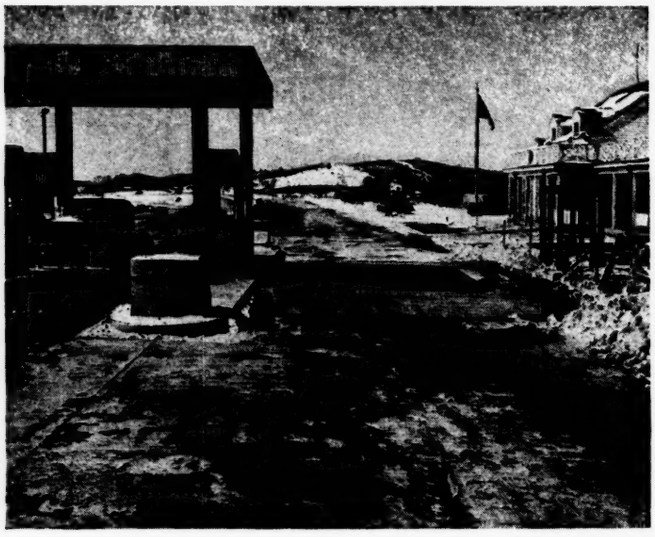
Snow Melting System Serves Toll Bridge

Although it has not gone through a winter of heavy snowfall, the snow melting installation at Old Saybrook, Conn., has demonstrated its value and its importance as a safety measure for winter driving.

WINTER collection of tolls and added safety for motorists approaching the toll booths were made possible through a snow melting system installed on the new Raymond E. Baldwin Bridge at Old Saybrook, Conn. This system has had one winter's service al-



Areas near the toll booths were kept clear of snow and ice by the snow melting system. At right is the Administration Building.

though the area served did not have much snowfall last winter. It is the first snow melting installation in the state.

The stretch of road provided with snow melting coils measures 82 ft across by 36 ft. Five toll booths are arranged in line across the highway so that there are 10-ft lanes on each side of the center booth, and a 22-ft lane adjoining each of the two outer booths.

Details of the System

The embedded coils are made of 1¼-inch wrought iron pipe, spaced on 12-inch centers and provided with a 2- to 6-inch cover. Coils rest on concrete blocks which in turn are on a gravel subbase. Care was exercised that the pipe was laid level and free from depressions or pockets. The panels or coils were prefabricated. One coil serves each of the 10-ft strips of road, and two are installed for each of the 22-ft wide outer lanes. One Sarco automatic air vent is installed for each coil. Before concrete was poured over the pipe, the coils were subjected to a 300-lb hydrostatic test for 12 hours to detect the location of any possible leaks.

Two heating systems are used. A Mills No. 340 (H. B. Smith Co.) oil-fired boiler supplies steam for heating the Administration Building to the north of the road, and for heating the three toll booths. Installed adjacent to the steam boiler is a Mills No. 240 boiler to supply hot water for the snow melting system. Both boilers have pressure atomizing type oil burners. That for the hot water system has a maximum burning rate of 5 gph.

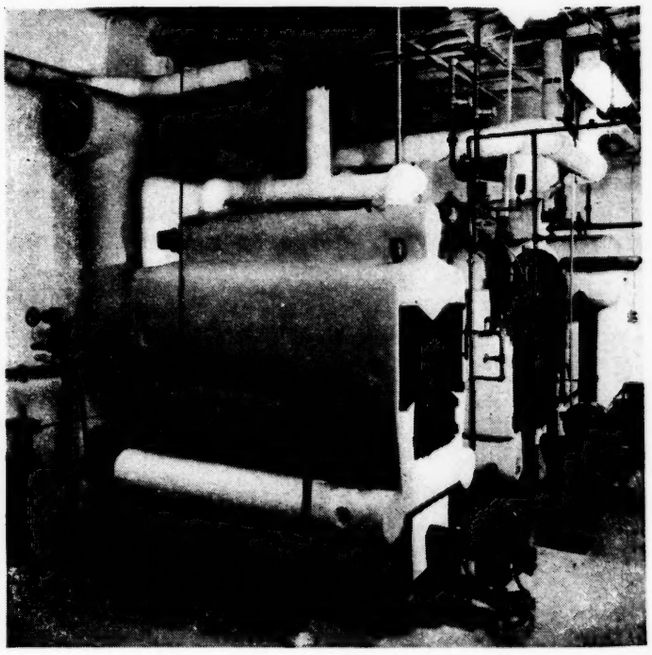
Hot water at 130F is supplied through a 3-inch supply line and is returned to the boiler at 120F through a 3-inch return. Circulation is provided by a 3-inch B & G pump. Each of the booths have valves for balancing the hot water flow. Sufficient permanent type anti-freeze compound has been added to the water to protect the coils even at temperatures as low as —30F.

The snow melting system is manually controlled to operate at the time of a snowfall.

A tunnel 5 ft wide by 8 ft high runs from the Administration Building under the roadway to the booths. Through the tunnel run the necessary supply and return lines, and electrical conduits. Here are placed the valves for draining the snow melting coils.

Due to the warm winter of last season, which had little snowfall, it was impossible to obtain representative cost figures on the operation of this system. For the times that the system was in operation, it has functioned well.

Project engineer for Connecticut on this improvement was Col. Howard S. Ives. Inspector actively in charge was Robert G. Pike. William M. Ford, Hartford, Conn., was the contractor who installed the system. Pipe fabricating was done by Atlantic Pipe Bending Co., Edgewater, N. J.



In the foreground is the boiler for the snow melting system. The other serves the Administration Building and booths.

79 Pointers for the SELECTION, ARRANGEMENT AND PIPING OF UNIT HEATERS

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C. H. KOPER

79 Pointers for the Selection, Arrangement, and Piping of Unit Heaters

C. H. KOPER
Heating and Ventilating Engineer
Cincinnati, Ohio

The following suggestions for selection, arrangement and piping of unit heaters are derived from the author's long experience as a specialist in this field. In some cases, the subject matter or diagrams have been simplified for the purpose of clarifying a particular point. The author feels that the comprehensive view is best served by individual treatment of the various factors involved.

FOR the purpose of discussion, the following numbered pointers are based, wherever plant characteristics are pertinent, upon a hypothetical, single-story plant exposed on all four sides measuring 50 ft x 100 ft with a 15-ft ceiling (Fig. 1). Heat loss for the building, at a 70F design temperature difference, is assumed to be 603,000 Btu per hr.

Selecting Unit Heaters

1 First step in selecting the size and number of unit heaters required is to determine the heat loss of the building by the usual Btu method. To use any other method is inviting trouble or failure.

2 In figuring the heat loss of the roof, estimate the temperature at the roof equal to the desired room temperature plus one-half to one degree for each foot of roof height above the floor.

3 The number of unit heaters to be installed depends on the heating comfort desired. The greater the number of unit heaters installed, the more uniform the temperature. A good unit heater system requires a generous number of unit heaters well distributed.

4 High outlet velocity, particularly with high final outlet air temperature, produces an undesirable condition when the hot air in motion is suddenly stopped by shutting off the motor. The reverse is also true. Use unit heaters with low outlet velocity and low final outlet air temperature, but not so low that the air in motion will have a tendency to chill the occupants during the winter months.

5 Air flow from one unit heater should support the air flow of the adjacent unit heater, as in Fig. 2, arrangements 21, 25, and 27, and should be parallel to the cold wall wherever possible. This arrangement will give minimum disturbance of cold air film on the outside walls and windows. Disturbing this film of cold air with warm air increases the heat loss through outside glass and walls.

6 The scrubbing effect of the warm air from unit heaters is greatest with arrangements 6, 12, 22, 23, 24, 28, 29, and 30, and at a minimum with arrangements 1 and 2.

7 Arrangements 21, 25, and 27 will give the greatest physical comfort. Nos. 1 and 2 will give the least physical comfort with a maximum economy of installation.

8 Arrangements 1, 2, 3, 7, 8, and 9 would be good for a stock room with bins on each side of building with a center aisle. If stock room has two side aisles as well as a center aisle, arrangements 4, 5, 10, 11, 16, and 17 would give more physical comfort but only when side aisles have a substantial width.

9 Arrangements 6, 12, 15, and 19 would be good for an open storage space such as automobile storage or where storage is not stacked too high. If storage will be damaged by the warm air from unit heater discharging against it, use a recirculating duct.

10 Arrangements 5, 7, 8, 11, 20, 23, 26, and 27 would be good where minimum physical comfort is required and boiler room is located near the middle of and on either side of the building. This arrangement will reduce the pipe work to a minimum.

11 Arrangements 22, 24, and 28 could be used to an advantage in a building that is more than 50 ft wide with a monitor skylight the full length of the building.

12 To counteract cold drafts from doors and other outside openings, air flow from the unit

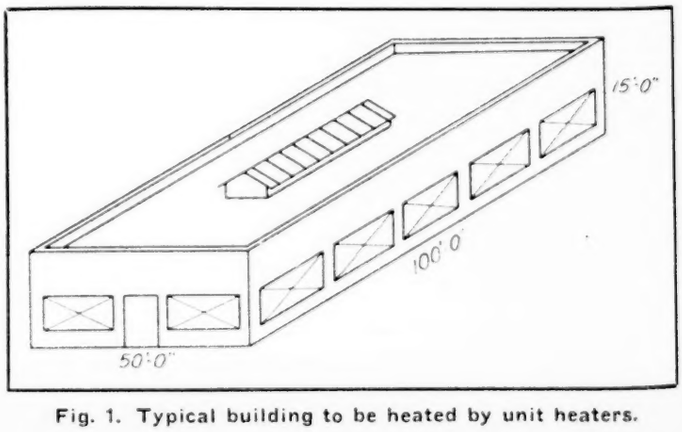

Fig. 1. Typical building to be heated by unit heaters.

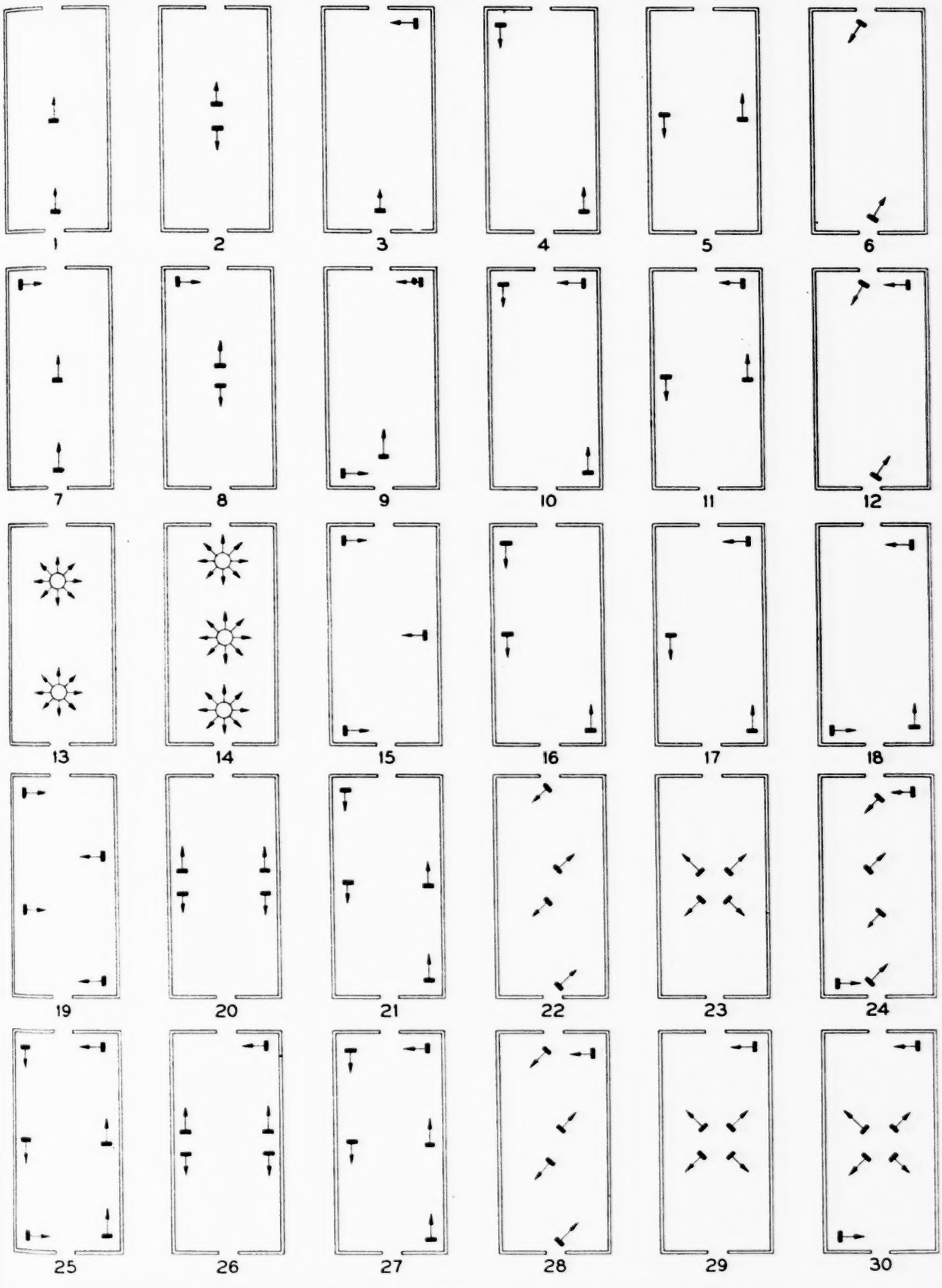

Fig. 2. Possible unit heater arrangements for building shown in Fig. 1.

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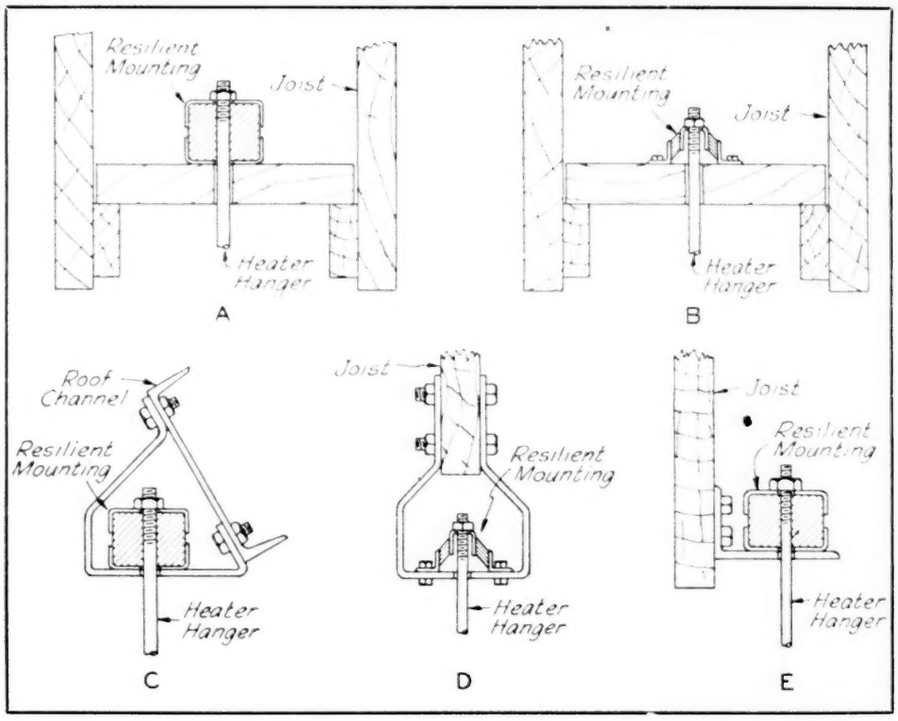

Fig. 3. (Left) Resilient mountings for unit heater vibration control.

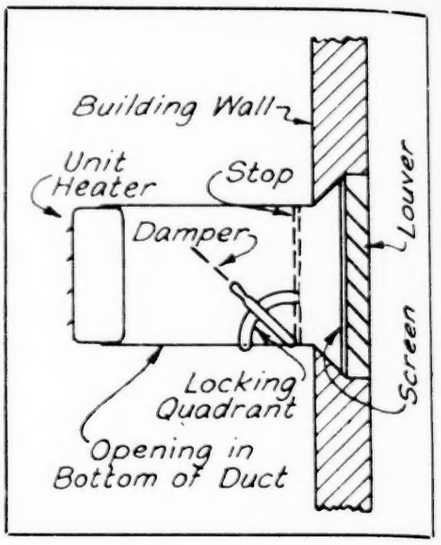

Fig. 4. (Above) Unit heater with duct to outside for warming make-up air.

heater should be across openings whenever possible, particularly so for large openings. Downblast or projection type heaters are ideal for counteracting cold drafts from doors when installed without deflectors directly over and just a few feet in front of the door, as in arrangements 13 and 14. In some cases it is advantageous to install an extra unit heater just to blanket the door openings, with an electric switch installed on the door to start the unit heater motor when the door is opened.

13 Downblast heaters give the most uniform temperature when the building is exposed on all four sides. Arrangement No. 13 is better than No. 14 for this building.

14 Unit heaters should be installed with the back and side of the heater not less than 3 ft from the wall. Unit heaters should always be installed at the height recommended by the manufacturer. When space below floor is heated, 2 ft may be added to recommended maximum installation height. Unit heaters with a recommended maximum installation height of less than 70% of the ceiling or roof height should not be used.

15 Vibration noises are greatly magnified when unit heaters are mounted or hung from steel building structure, particularly so when roofing is sheet metal. The same thing occurs in some buildings of wooden construction when the space above unit heater installation is occupied and noise is objectionable. It is hard to predict when it will take place. Under such conditions resilient hanging insulation arranged as in Fig. 3 should be provided.

16 Most of the noise of a unit heater is created by the fan cutting the air into motion. When noise is a factor, select unit heaters with the desired decibel rating and not by rpm. In comparing decibel ratings, be sure that readings for determining ratings were made at, or at least near, the same point.

17 When quiet operation is desired, it is good practice to use three-speed motors, with the middle speed producing a little less than the required, maximum demand.

18 In areas having one or more air exhausting systems or exhaust fans, determine the capacity of these systems and provide heating capacity for

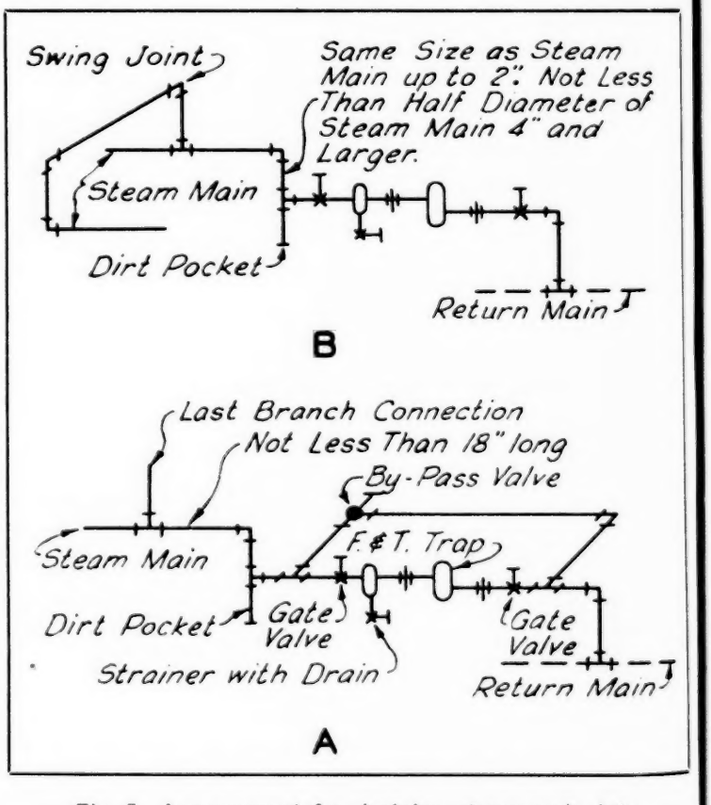

Fig. 5. Arrangement for draining steam main into return main beyond last branch connection.

this volume of air which will be drawn into this area through crevices around doors and windows. Better still, install one or more unit heaters with air intake extended to the outside, as in Fig. 4. Total air capacity of these unit heaters should equal or exceed that of the exhaust systems. The air intake duct of such unit heaters should be provided with a swinging gate type damper, so arranged that when the outside opening is closed, the duct will be open to the room. This will prevent starving the unit heater of air and causing motor trouble. This arrangement will also permit regulating the amount of fresh air taken in through the unit heater. The free area of the outside louver should be equal to area of the duct.

19 Air flow from unit heaters supplying fresh air should never be toward exhaust system intakes or exhaust fan inlets.

20 When outside air is taken through the heater the steam pressure at the heater must not be less than 5 lb; in extremely cold climates not less than 10 lb. When steam pressure and/or air inlet temperatures are other than standard (2 lb steam, 60F inlet air) make corrections for existing conditions in designing piping systems and determining boiler load.

Piping Systems

21 Total pressure drop in steam mains and connections of low and high pressure steam systems should not exceed 25% of the initial steam pressure at the boiler or low pressure side of a reducing valve.

22 Total pressure drop in low pressure return piping systems (less than 15 lb gage) should be the same as the steam piping but not more than 4 oz per 100 ft equivalent direct run of pipe, nor more than 4 oz drop per 100 ft equivalent direct run of pipe for vacuum pump return systems.

23 Connections to all mains should be made at top of main with a 45-degree or a 90-degree elbow. Last connection at end of main should be not less than 18 in. from the end.

24 Provide for expansion and contraction of all steam piping, particularly for high pressure steam piping. Also for high pressure return piping systems. The expansion of pipe with 100-lb steam is almost twice as much as pipe with 2-lb steam, approximately 2½ in. and 1½ in., respectively, per 100 ft of length.

25 Drip or drain all steam mains into return piping system at extreme end, as in Fig. 5. Long steam mains should have intermediate drips or drains.

26 It is good practice to install a three-valve bypass around all traps draining the steam piping of large installations or at least a shut-off valve on each side of the trap. Suggested arrangement is shown in Fig. 5.

27 Sediment strainers should be installed ahead of all traps draining steam mains. Also a dirt pocket for collecting large, heavy particles, as in Fig. 5. Sediment strainers need be installed on unit heaters only when branch steam connection is extra long or steam connection is made at bottom of steam main. Then it should be installed in steam connection and as close to unit heater as possible, as heating elements are made of copper or copper alloy.

28 Pitch all piping one inch in 20 ft except where steam and condensate flow in opposite directions; then pitch piping one inch in 5 ft.

Low and High Pressure Piping

29 For steam pressures of 5 lb and less, branch connection to unit heaters should be one or two pipe sizes larger than unit heater tapping, particularly so when connection is longer than 5 ft. High pressure steam connection to unit heaters should be not less than unit heater tapping.

30 A shut-off valve should be installed in the steam connection of each unit heater or group of unit heaters. When a shut-off valve is installed in the branch steam connection, it should be located near the steam main whenever practical, and should not permit the forming of a water pocket when the valve is closed.

31 Steam on the low pressure side of a reducing valve contains superheat. This superheat is almost equal to the difference in temperature between the steam on the high pressure side of the reducing valve and the temperature of the boiling point of water under a pressure equal to the pressure on the low pressure side of the reducing valve. When this superheat interferes with the heat-emitting capacity of unit heaters, install a de-superheater. You have heard old timers say, "There is more heat in exhaust steam."

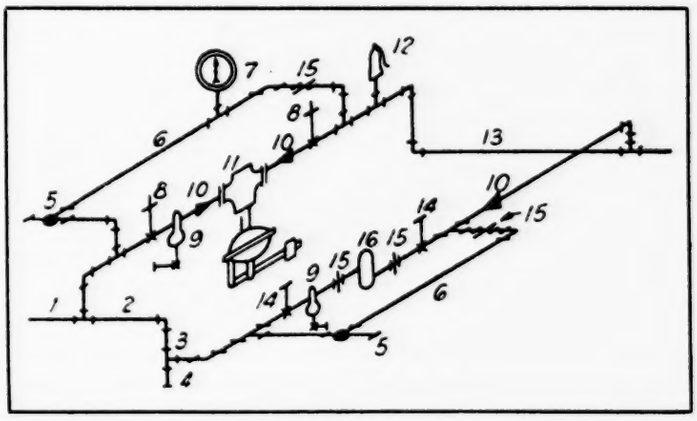

Fig. 6. Method of reducing superheat on low pressure side of a reducing valve. Legend: (1) High pressure steam main. (2) End of steam main, not less than 18 in. long. (3) Drip leg not less than 6 in. long, same size as steam main up to 2 in., not less than ½ diameter of steam main 4 in. and larger. (4) Dirt pocket. (5) By-pass valve. (6) By-pass. (7) Pressure gage. (8) O. S. Y. gate valves. (9) Strainer with drains. (10) Reducing coupling. (11) Flanged pressure reducing valve. (12) Safety valve. (13) Low pressure steam main. (14) Gate valves. (15) Union. (16) Mechanical float or bucket trap.

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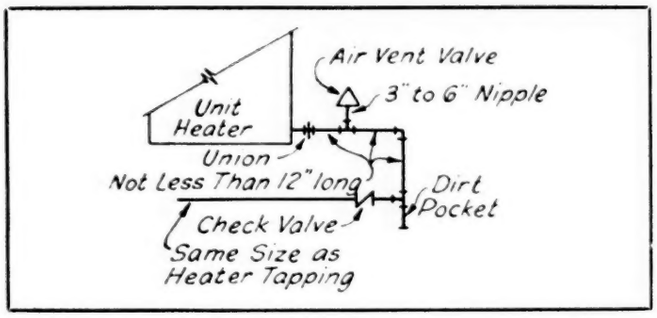

Fig. 7. Return piping for low pressure air vent system.

32 One way of reducing some of the superheat on the low pressure side of a reducing valve is to connect the discharge from the mechanical trap draining the end of the high pressure steam main at the reducing valve into low pressure steam main near the reducing valve, as in Fig. 6. The amount of condensate available for reducing the superheat depends on the length of the high pressure steam main and whether or not it is insulated.

Low Pressure Returns

33 In return piping for low pressure air-vent systems (less than 15 lb gage) the size of return connections from unit heaters should be no less than the unit heater tapping. Under same conditions it may be necessary to increase the return connection from the unit heater one or two pipe sizes to prevent a water-hammer.

34 The air-vent valve tee must be installed in the horizontal run of the return connection, with not less than a 12-in. nipple in each end of the air-vent valve tee, as in Fig. 7. The air-vent valve must be installed in the horizontal return connection, that is 12 in. or more above the check valve, and should be elevated 3 to 6 in. above return connection. High elevation of the air-vent valve is not necessary. Vacuum air-vent valve may be used on unit heaters *only* when the steam connection is not provided with a shut-off valve and return connection from the heater is made to a wet return and not provided with a shut-off valve or check valve.

35 A check valve must be installed in the return connection from a unit heater when it is connected to a dry return. A check valve must be installed in the return connection whenever the supply is provided with a shut-off valve. A check valve need not be installed in the return connection when one or more unit heaters are connected to a common wet return and the steam connection is not provided with a shut-off valve.

36 Check valves in return connections from unit heaters must be of the swinging type, with 15-degree seat type preferred. The check valve must be 12 in. or more below the bottom of the heater.

Low Pressure Trap System Returns

37 In return piping for low pressure trap systems (less than 15 lb gage) the size of the return connection from unit heater to trap should not be less than the unit heater tapping, with inlet trap tapping size connection as short as possible, as in Fig. 8.

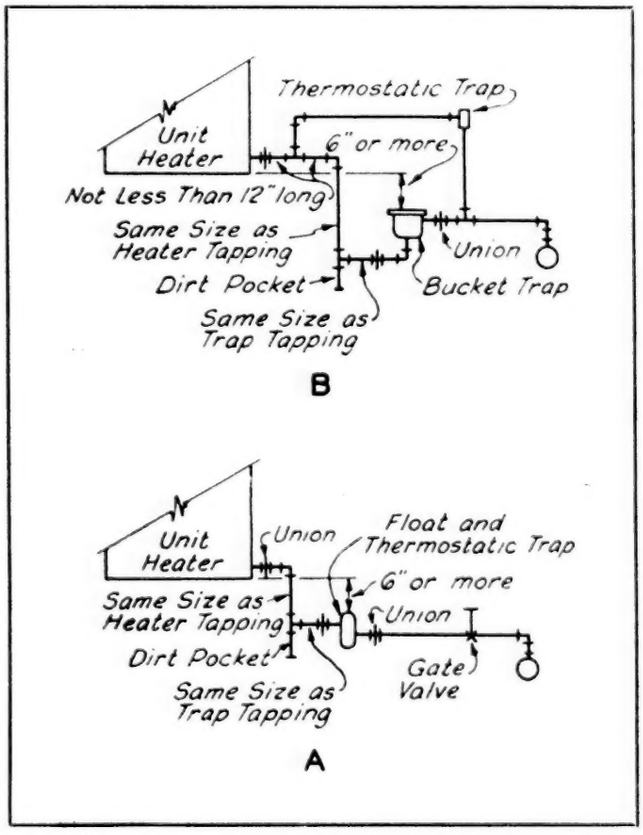

Fig. 8. Return piping for low pressure trap system.

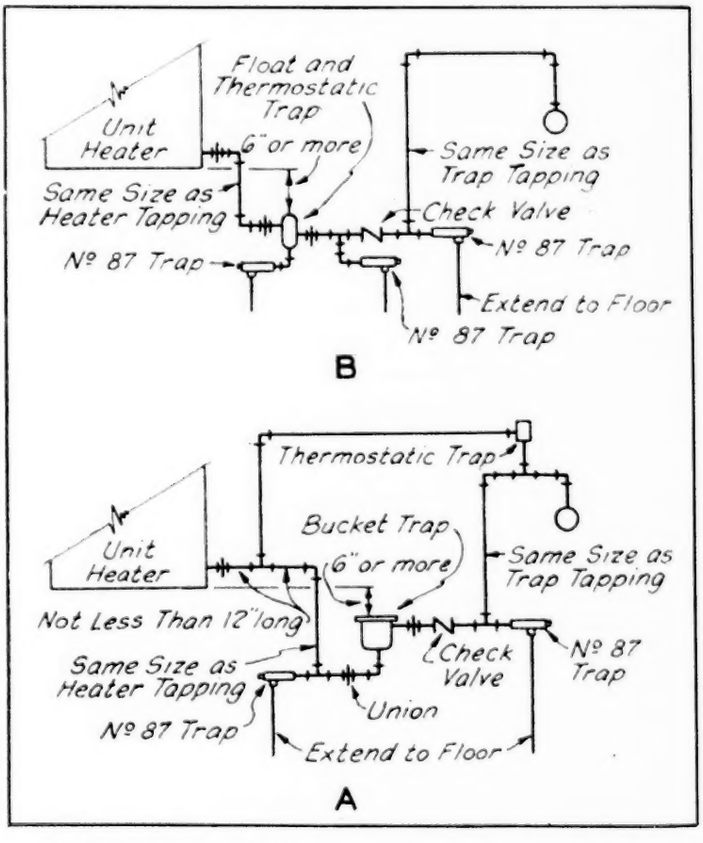

Fig. 9. Return piping for low pressure trap system when return main is higher than bottom of unit heater. No. 87 traps are thermally operated draining traps with liquid-filled elements.

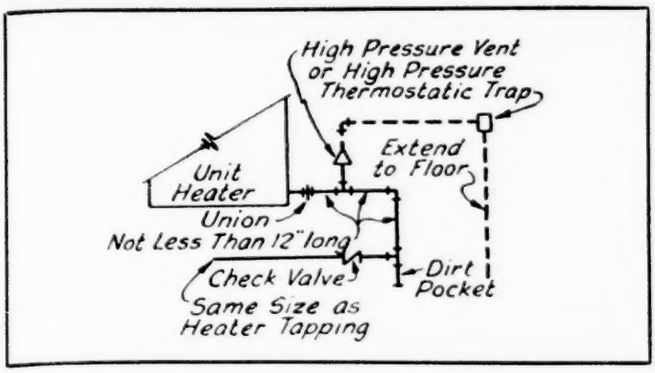

Fig. 10. Return piping for high pressure air vent system.

38 Under some conditions it may be necessary to increase the return from unit heater one or two pipe sizes to prevent a water-hammer. The top of the bucket trap must be 6 in. or more below the bottom of the water. The size of the discharge connection from trap to return main should be not less than trap tapping or increased in size to equal the designed pressure drop in the return piping system.

39 Traps for unit heaters can be either combination float and thermostatic traps or inverted bucket traps with a thermostatic trap air bypass. Trap capacity must be not less than twice the rated condensing capacity of the unit heater, and each heater must be individually trapped.

40 When the trap is lower than the return main, steam pressure should be one pound for each foot of elevation, and low points of piping on each side of the trap should be provided with a drain valve. When danger of freezing is serious, make the draining of all low points automatic by the use of thermostatic traps with liquid filled thermostatic element set to open at a low temperature. Such traps must be installed as close to piping as possible, as in Fig. 9. When the bucket or float trap is lower than the return main, always install a check valve in the return connection on the discharge side of the trap.

41 When it is necessary to use a vacuum pump the vacuum created should be only great enough enough to do the required work. When water of condensate under 10 lb steam pressure is discharged through a trap into a return with 10 in. of vacuum, each 20.5 lb of condensate, or condensate from 82 sq ft E.D.R., discharged will produce approximately 1 lb of flash steam. This 1 lb of steam under 10 in. of vacuum has a volume of 39.4 cu ft. The greater the vacuum the greater the volume of flash steam and the greater the velocity of the steam over the water in the return piping.

42 Steam either above or below zero gage pressure moving at a high velocity over condensate in horizontal piping will whip the water into waves and cause water-hammer.

Water-hammer occurs in many places, but usually in return piping systems where the depth of water is much greater in proportion to the diameter of the pipe than in steam supply piping where there is very little condensate except possibly at the end of the main of a one-pipe steam system.

Water-hammer is not only annoying but will also ruin equipment, especially traps and check valves.

In air vent systems, steam is present in all pipes.

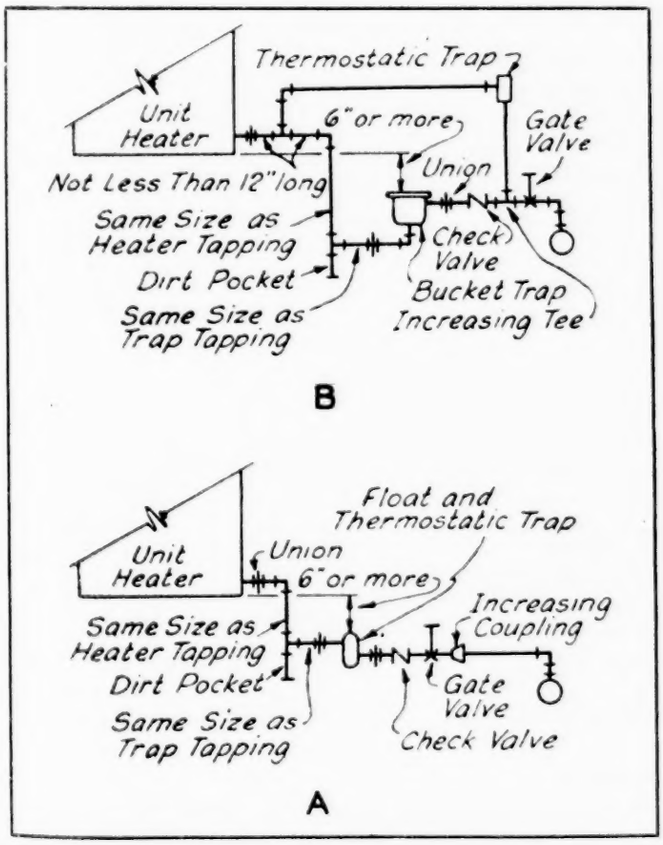

Fig. 11. Return piping for high pressure trap system.

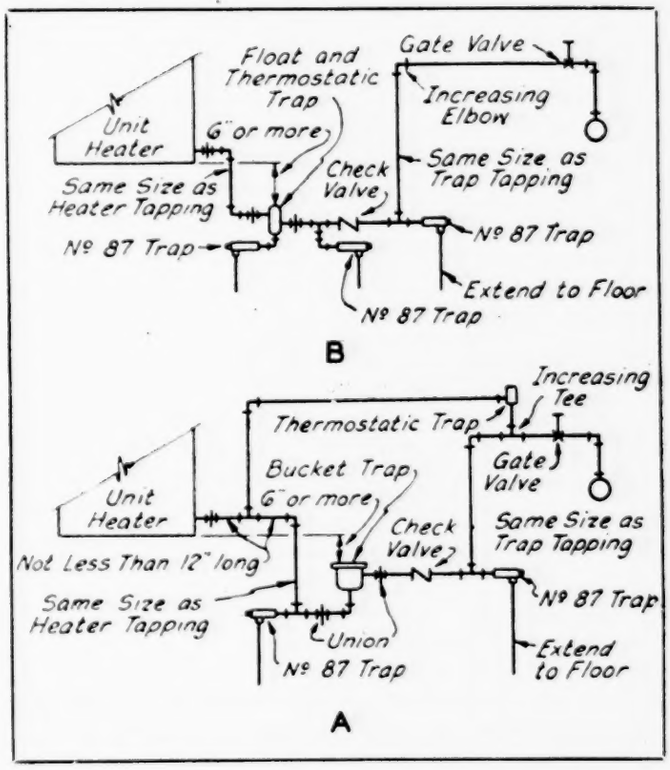

Fig. 12. Return piping for high pressure trap system when return main is above bottom of unit heater. No. 87 traps are thermally operated draining traps with liquid-filled elements.

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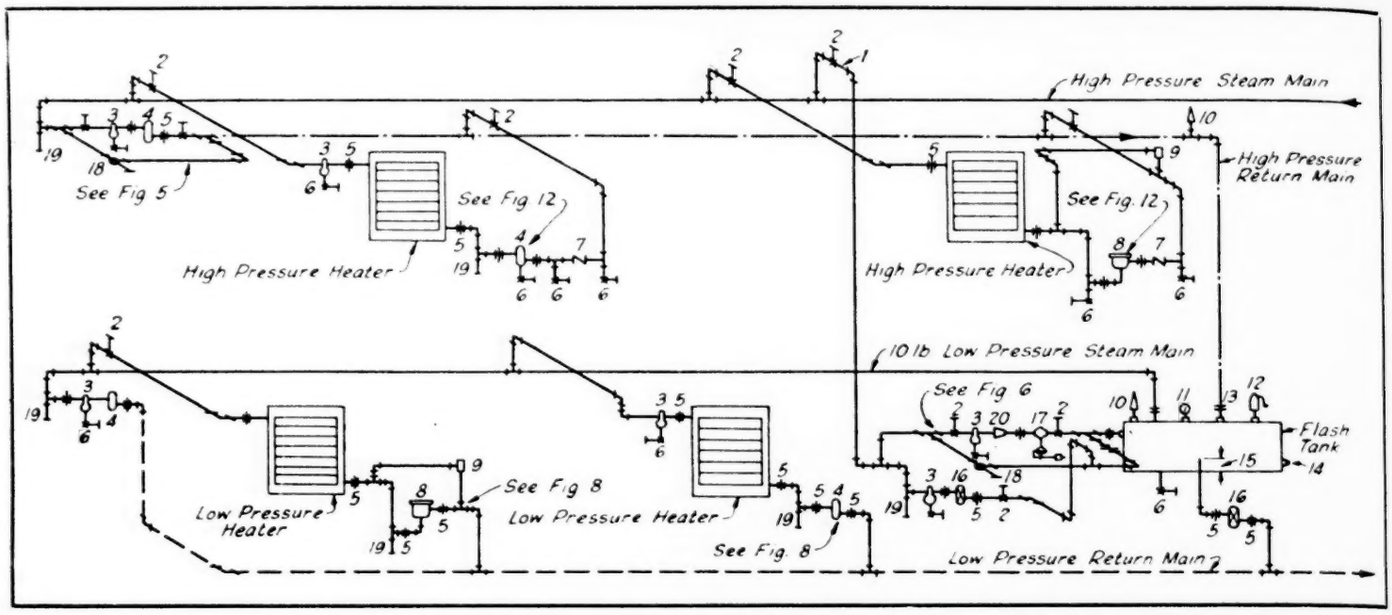

Fig. 13. A piping and flash tank arrangement for utilization of flash steam with unit heaters or other equipment using low pressure steam. Capacity of low pressure heating equipment should not exceed 75% of total flash steam. Local conditions will dictate what this percentage should be. Legend: (1) High pressure steam to flash tank. (2) Gate valve. (3) Strainer with drain valve. (4) Float and thermostatic trap. (5) Union. (6) Drain valve. (7) Check valve. (8) Inverted bucket trap. (9) Thermostatic trap (air by-pass). (10) Large port air vent. (11) Pressure gauge. (12) Safety valve set for maximum desired back pressure. (13) Flange union. (14) Inspection plug. (15) Extend return connection into tank ¼ diameter of tank. (16) Float trap. (17) Pressure reducing valve set at a lower pressure than the desired back pressure. (18) By-pass and by-pass angle valve. (19) Dirt pocket. (20) Reducing coupling.

In trap systems, steam in the return piping is caused by flashing from the condensate or by leaky traps or both.

A body of steam between two bodies of water is the only thing that will cause water-hammer in a steam system. When there is just a rumbling noise the two bodies or waves of water do not touch the top of the pipe simultaneously or the two waves are far apart.

When the two bodies or waves of water do touch the top of the pipe simultaneously the steam between these two waves will condense instantly, a vacuum is created and the two waves are drawn together with great force and a decided hammer.

One cubic inch of steam or vapor at 10 in. of vacuum contains .0144 Btu of latent heat; at zero gage pressure, .0209 Btu of latent heat; and at 10 lb gage, .0338 Btu of latent heat.

High Pressure Air-Vent System Returns

43 In return piping for high pressure air-vent systems (over 15 lb gage) the size of return connection from the unit heater should be not less than heater tapping. Under some conditions it may be necessary to increase the return connection from the unit heater one or two pipe sizes to prevent water-hammer.

44 If a high pressure air-vent valve is not available for the steam pressure in the unit heater use a thermostatic trap as an in air-vent valve. Air-vent valve or trap tee must be installed in the horizontal run of return connection, with not less than a 12-in. nipple in each end of the air-vent valve tee, as in Fig. 10.

45 The air-vent valve or trap tee in the return connection should be 12 in. or more above a check valve, as in Fig. 10. When a high pressure thermostatic trap is used as an air vent the discharge from the trap should be located near a wall and extended to a point near the floor.

46 In high pressure systems, too, the check valve in the return connection from the unit heater must be of the swinging type, with the 15-degree seat type preferred. Again, the top of the check valve must be 12 in. or more below the bottom of the heater. A shut-off valve and a check valve must be installed in return connections, and a shut-off valve installed in steam supply connections of all high pressure unit heaters.

High Pressure Trap System Returns

47 In high pressure trap systems, the size of return connections from unit heaters to traps should not be less than heater tapping, with trap inlet connection as short as possible. Under some conditions it may be necessary to increase the return connection one or two pipe sizes to prevent water-hammer. The top of the trap must be at least 6 in. below the bottom of the unit heater, as noted in Fig. 11.

48 Traps for unit heaters can be either combination float and thermostatic trap or inverted bucket trap with a thermostatic trap air by-pass, as shown in Fig. 11.

49 Trap capacity for unit heaters must be at least twice the rated condensing capacity of the heaters for true pressure differential between the inlet side of the trap and the outlet or discharge side of the trap. Each unit heater must be individually trapped.

50 The following rules apply to the high pressure trap system:

(1) A check valve must be installed in discharged connection of all traps.

(2) A shut-off valve should be installed in steam and return connection of all unit heaters.

(3) Size of outlet connection from trap should be not less than trap tapping, as short as possible, and increased to proper size, as in Fig. 11 and 12.

(4) When trap is lower than return main, low points of piping should be provided with drain valves or traps, as in Fig. 12.

51 When danger of freezing is serious, make draining of all low points automatic with the use of thermostatic traps with liquid filled thermostatic elements (designated No. 87 in Fig. 12) set to open at a low temperature and as close to piping as possible.

52 Condensate in a high pressure steam system has approximately the same temperature as the steam up to and including the trap. When high temperature condensate is discharged through a trap into a lower pressure return piping system, a part of the condensate will flash into steam at the trap seat orifice. Every degree of temperature difference between the high pressure condensate and the boiling point of water at the pressure in the low pressure return piping equals one Btu per pound of high temperature condensate discharged through the trap. For example, the temperature of condensate and steam at 100 lb gage is 338F and the temperature of condensate and steam at zero gage is 212F. The temperature difference is 126F or 126 Btu per lb of high temperature condensate. These 126 Btu equal 13% of 970 Btu, the latent heat in one pound of steam at zero gage pressure. Then every 7.7 lb of condensate discharged from a 100 lb steam system into a zero gage pressure area will produce one pound of flash steam which contains 970 Btu's of latent heat.

TABLE 1—PERCENTAGE OF FLASH STEAM FROM HIGH TEMPERATURE CONDENSATE

Pressure in Steam Supply System, Lbs.	Pressure in Return System, Pounds			
	0	5	10	15
	Percent of Condensate Converted to Flash Steam			
10	2.9	1.2		
25	5.7	4.1	2.8	1.8
50	8.8	7.3	6.1	5.0
75	11.2	9.6	8.4	7.4
100	13.0	11.5	10.3	9.3

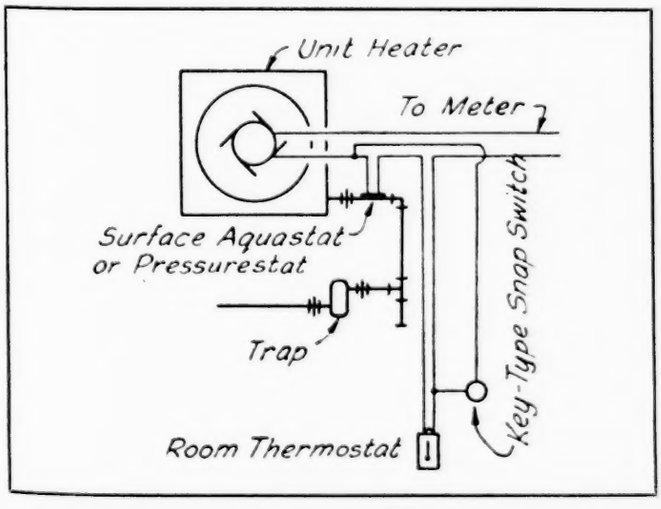

Fig. 14. Recommended control system for unit heaters.

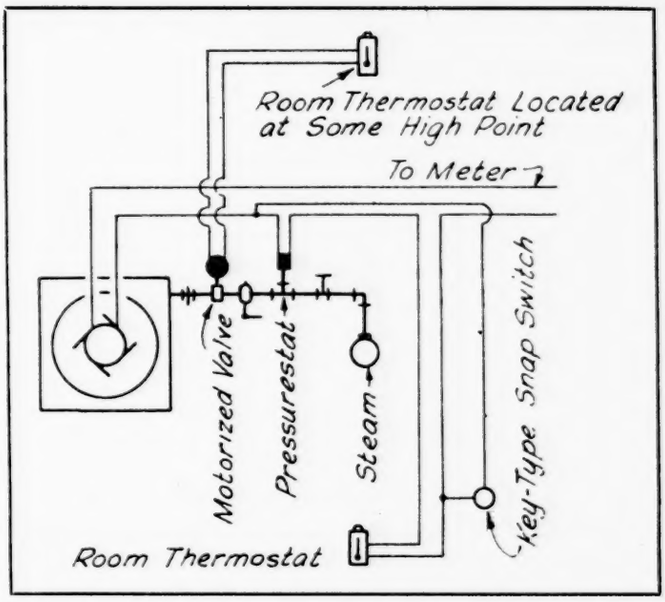

Fig. 15. Controls provided with cross-over switch for summer operation of unit heater motor.

53 The percentage of flash steam liberated from high temperature condensate depends on the difference in pressure between the high and low pressure areas, as set forth in Table 1. A piping arrangement for utilizing flash steam is shown in Fig. 13.

54 The steam pipe sizes of a high pressure steam system are small compared to those of a low pressure steam system. The pipe sizes of a return system for high pressure steam will in some cases equal those of the steam system and in many cases they will be larger.

TABLE 2 — STANDARD LOW PRESSURE RETURN PIPE CAPACITY TABLES TO BE USED FOR HIGH PRESSURE SYSTEM RETURN SIZING

			Back Pressure in Return	
			Zero Gage	5 lb gage or more
For Supply Steam Pressure of	16 to 25 lb	Use Low Pressure Table for	1 oz drop	4 oz drop
	26 to 50 lb		½ oz drop	2 oz drop
	51 to 100 lb		2 oz drop	1 oz drop

55 When a return system for high pressure steam is sized too small, there will be water-hammer and pipe erosion due to the flash steam and condensate traveling at a high velocity.

The back pressure maintained in the return system will determine the amount of flash steam in the return piping and will have a bearing on the sizing of the return piping system. The greater the back pressure, the less flash steam will be in the return piping.

The greater the back pressure in the return system, the less will be the pressure differential between the

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inlet and outlet of the trap; and traps must be selected for the actual pressure differential.

To size a high pressure return piping system use Table 2 which refers to standard low pressure steam return pipe capacity tables with various pressure drops for various steam pressures as noted. Pressure drops are for 100 ft equivalent length run of pipe.

56 This table assumes that one-half the cross area of the return pipe is used by the water of condensate and the other half is available for the flash steam with a velocity approximating 800 to 1500 fpm for pipe sizes 1½ in. and smaller, and 1500 to 3000 fpm for pipe sizes 2 in. and larger.

57 It is not practical to use a vacuum pump on high pressure return systems because of flash steam, which fills the return piping system in the following relationship:

Vacuum in inches of mercury	0	5	10	15	20	25
Volume of steam in cu ft per lb	27	32	38	53	74	170

Hot Water Heating Systems

58 The following points apply to hot water heating systems using unit heaters:

(1) Unit heaters will not give satisfactory results in gravity hot water systems.

(2) When unit heaters and radiators are installed in the same system use a separate circulator for unit heaters and another for radiators.

(3) Be sure circulating pump has ample water capacity and will deliver the required volume of water against the total friction head of the system.

(4) The total friction head of the system is limited only by the ability of the circulating pump.

(5) The piping system for a unit heater installation should be a two-pipe system.

(6) Where practical, use the balanced system of piping.

(7) Flow connection must be made to top of unit heater.

(8) Provide all high points of system with automatic air relief valves.

(9) Provide all low points with drain valves.

(10) Air intake on unit heaters in hot water heating systems must never be extended to outside air when there is danger of freezing the water in the unit heater.

Controls

59 The simplest type of temperature control for unit heaters is to manually start and stop the electric motor. Unit heaters emit about 10% of their rated capacity when the electric motor is not running.

60 The simplest automatic temperature control for unit heaters is a room thermostat. There are two types of room thermostats, line voltage and low voltage. A high voltage thermostat is installed in a line serving one or more unit heaters with current consumption not in excess of the capacity of the electrical contact of the thermostat.

61 A low voltage thermostat is connected to a relay or magnetic switch in the line serving one or more unit heaters. Relays or magnetic switches are manufactured with various current capacities so there is no limit to the number of unit heaters that may be connected to a relay or magnetic switch. Never install a room thermostat in a dead air pocket or in the air flow from a unit heater. It may be installed in the air flow to the heater.

When it is necessary to mount a room thermostat on an outside wall the instrument should be installed on a bracket that will hold the instrument out from the wall not less than 2 in., with insulation between the back of the thermostat and the bracket. This will permit the cold air descending the wall to pass behind the thermostat and not interfere with the operation of the thermostat.

62 To prevent a unit heater from circulating cold air during the winter months when steam pressure is down, install a reverse acting surface aquastat on the return connection from the unit heater and connect it to the electric wiring system to the unit heater motor.

63 Surface aquastats for steam systems must be installed between unit heater and air vent valve or unit heater and trap. On a hot water system, the aquastat may be installed at any point in the unit heater return connection.

64 The temperature range of a reverse acting aquastat for steam systems must be higher than 200 degrees. Reverse acting pressurestats may be used in place of reverse acting surface aquastats on steam systems and are preferred in many cases.

65 Reverse acting immersion type aquastats may be used in place of reverse acting surface aquastats on a hot water system when pipe size is increased sufficiently to allow for the obstruction of the thermostat bulb.

66 The recommended control system is a combination of room thermostat and surface aquastat or room thermostat and pressurestat, as in Fig. 14 and 15.

67 When unit heaters are on a separate or independent electric circuit, a reverse acting surface aquastat may be installed at the extreme end of the steam main, or a reverse acting pressurestat may be installed at any point in the steam main and all unit heaters can be controlled from one instrument through a relay or magnetic switch.

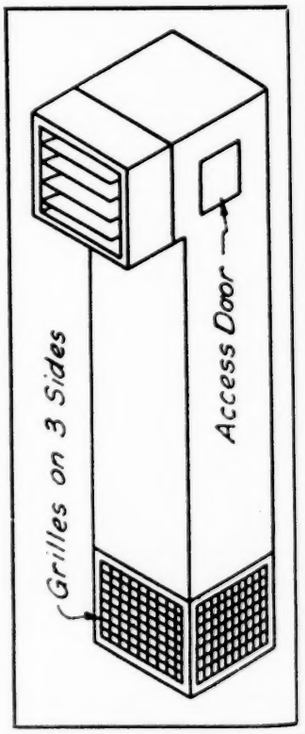


Fig. 16. Unit heater with recirculating duct.

68 All reverse acting switches and room thermostats should be provided with cross-over switches in the line so that motors may be operated during summer months, as in Fig. 14 and 15.

69 When boiler is automatically fired, a separate room thermostat, set a degree or two higher than room thermostats controlling unit heater motors, may be used to start the fire before unit heaters call for heat.

70 In heated spaces with very high ceilings, control systems can be improved by the addition of a motorized valve installed in the steam connection of a unit heater or group of unit heaters. The room thermostat controlling the motorized valve should be located at some high point near and back of the unit heater (see Fig. 15). This arrangement will permit the unit heater to force the warm air at the high level to the floor when the room thermostat controlling the heater calls for heat. The high-level room thermostat will turn steam into the heater when air temperature at the high level drops to a predetermined temperature. Local conditions will govern this predetermined temperature. When this arrangement is used, a reverse acting pressurestat must be installed on the steam connection ahead of the motorized valve. When unit heaters are used to heat outside air always install a reverse acting pressurestat in steam connection to unit heater.

Recirculating Ducts

71 Recirculating ducts, Fig. 16, are used on unit heaters when downward air motion from the heaters is objectionable or impractical. When a unit heater is equipped with a recirculating duct, the air may be discharged horizontally from the face of the heater. As the cold air is drawn from the floor and passed through the unit heater, the warm air discharged from the unit heater is drawn downward. It is good practice to use recirculating ducts on unit heaters installed in offices, drafting rooms, assembly halls, and the like.

72 When a unit heater is provided with a recirculating duct, it should be installed in the coldest corner to avoid drawing the cold air across the floor to the unit heater. It is uncomfortably cold within a radius of six or eight feet of a recirculating duct due to the air motion toward the duct inlet. The heater should be connected to the duct with a canvas connector; particularly so if the duct is made of sheet metal.

73 The duct area should be sufficient so that air velocity will not exceed 300 fpm for small size heaters and 400 fpm for large size heaters. If the duct is made the same dimension as the face dimension of the unit heater, the air velocity will usually be within the limits specified.

74 When the heater is to be set flush with the duct, the depth dimension of the duct must be increased an amount equal to the depth of the unit heater. The recirculating duct may terminate at a distance above the floor equal to the largest dimension of the duct or they may extend to the floor and be provided with a grille. When a grille is used, the free area of grille must equal or be in excess of the duct area.

75 Unit heaters provided with recirculating ducts may be installed two to three feet higher than the recommended height when necessary.

76 When a unit heater is provided with a recirculating duct, a louvered opening with a free area equal to the duct area may be cut into the outside wall for fresh air supply to the room. With this arrangement, it is necessary to provide the duct with a swinging gate type damper so arranged that it will completely close off either opening in one operation, as in Fig. 17. This arrangement will also permit regulating the amount of fresh air taken in through the unit heater.

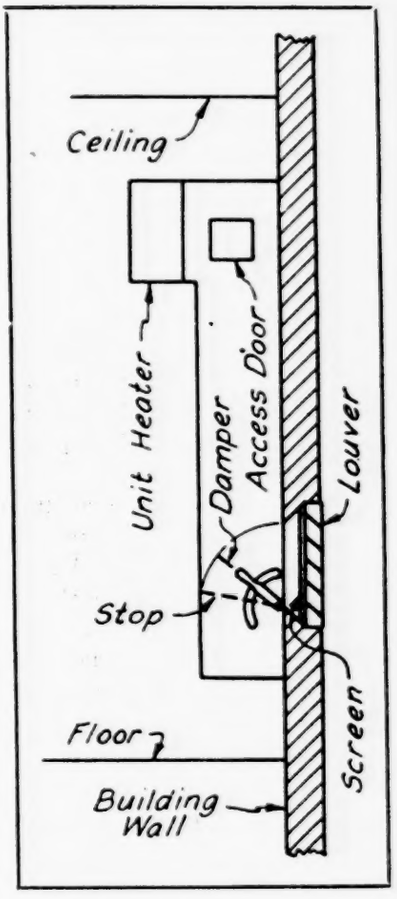


Fig. 17. Unit heater with recirculating duct opening to both inside and outside air. Swing gate damper selects source of air to be heated.

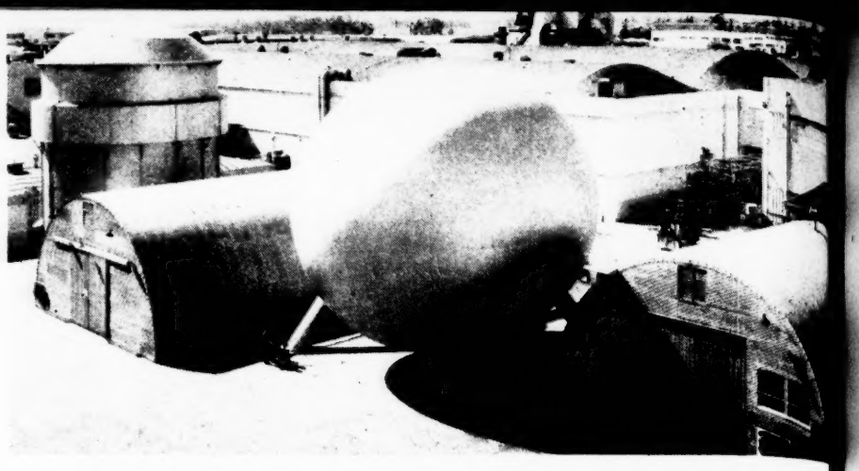
Air Filters

77 Air filters may be used on unit heaters where it is an advantage to reduce dust deposit on displays, or where air-borne particles will clog the heating element. A unit heater with recirculating duct and air filters makes an ideal installation for paint shops. Dust disturbed from the floor seldom rises high enough to fall on the newly painted surface.

78 Air filters used on propeller type fan unit heaters must always be of the low resistance type. Filter area must never be less than twice the face area of the heater. If air is heavily laden with dust particles, make the filter three or four times the face area of the heater.

79 Filters may be attached to the back of the heater when suspended from the ceiling without a recirculating duct, or back of the grille in the base of a recirculating duct. Clean or replace filters frequently to prevent starving unit heater of air and causing motor trouble.

Supersonic Wind Tunnel

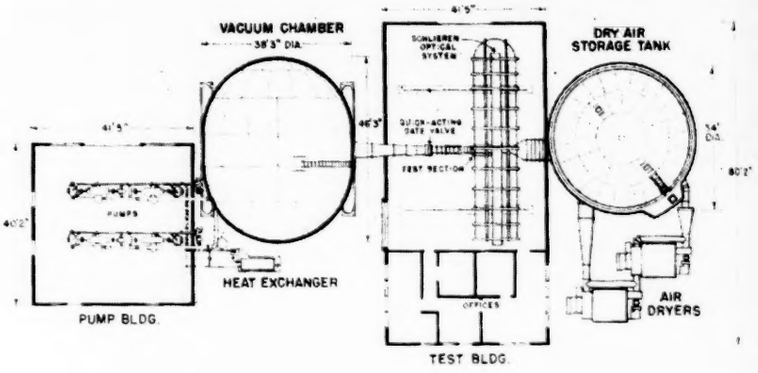


Main structures of North American Aviation's supersonic wind tunnel are, left to right above, the dry air storage tank, test building, vacuum chamber, and pump building. Plan below shows structures in reverse order.

BLASTING airstreams capable of speeds more than five times faster than sound, the new North American Aviation supersonic wind tunnel will test guided missile and aircraft models for speeds over 4,000 miles per hour.

Largest supersonic wind tunnel operated in this country by an aircraft company, the intricate test facility was built to keep pace with new and rapid developments in the fields of guided missiles and high speed piloted aircraft. Aerodynamic data concerning supersonic speed performance can be obtained more accurately and with much greater ease with the large wind tunnel.

The faster-than-sound wind tunnel consists of four major units; the dry air storage tanks with a capacity of 22,500 cubic feet; the 36,000 cubic foot vacuum chamber which can be evacuated to a 99.8% complete vacuum; the test section where the wind tunnel tests with scale models are performed; and the vacuum pumps.



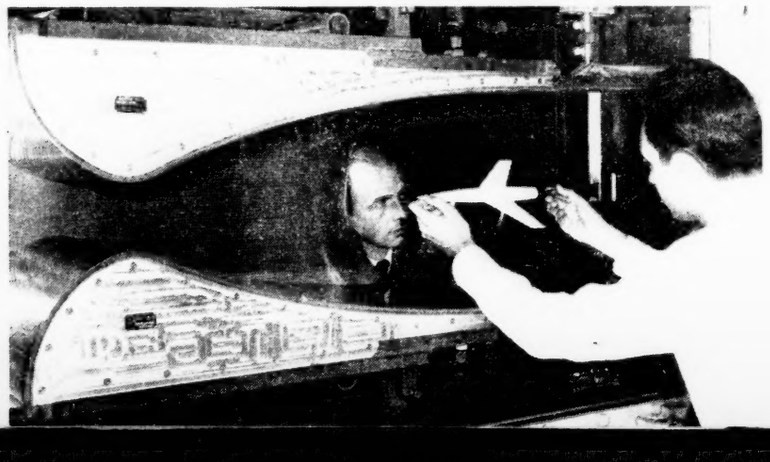
Plan of wind tunnel showing location of test section and optical viewing system.

Operation of the tunnel is relatively simple. While the vacuum chamber is being evacuated, the air storage tank is being filled with air dried to a dew point of —20F. Ducting connects the two units, with the test section located between the vacuum chamber and the air storage tank. When a gate valve in the tunnel duct is opened, dry air stored under a flexible, balloon-like membrane in the storage tank is forced by atmospheric pressure into the vacuum chamber. This airflow passes through the 16 inches by 16 inches test section, where aircraft or missile models are mounted for testing at supersonic speeds.

As an example of the extreme force involved in this operation, the vacuum chamber withstands an atmospheric pressure of 12,000,000 pounds on its exterior when evacuated.

North American engineers have adapted the Schlieren optical system for use in obtaining aerodynamic data during supersonic test runs in the tunnel. A beam of light is directed through the test section where a scale model is mounted for testing. As air passes over the model, it is condensed or expanded corresponding to the aerodynamic characteristics of the aircraft's surface, and the beam of light is refracted according to the airflow pattern. Through a series of mirrors, this pattern can be recorded by a camera, providing engineers with an actual photograph of shock waves and airflow.

Mounting guided missile model in test section. Hardwood nozzle blocks form throat between aluminum plates when section access door is in place. Blocks of various sizes vary air speed from 930 to over 4,000 mph past model.



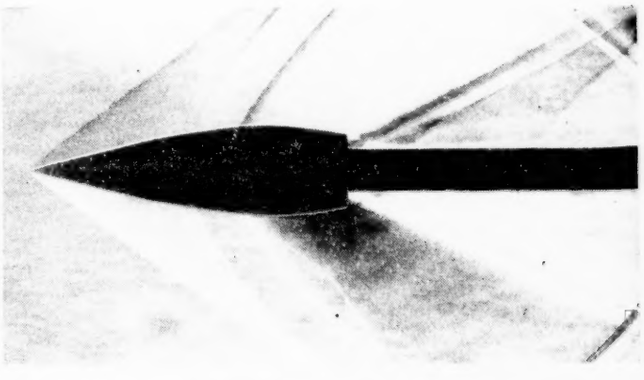
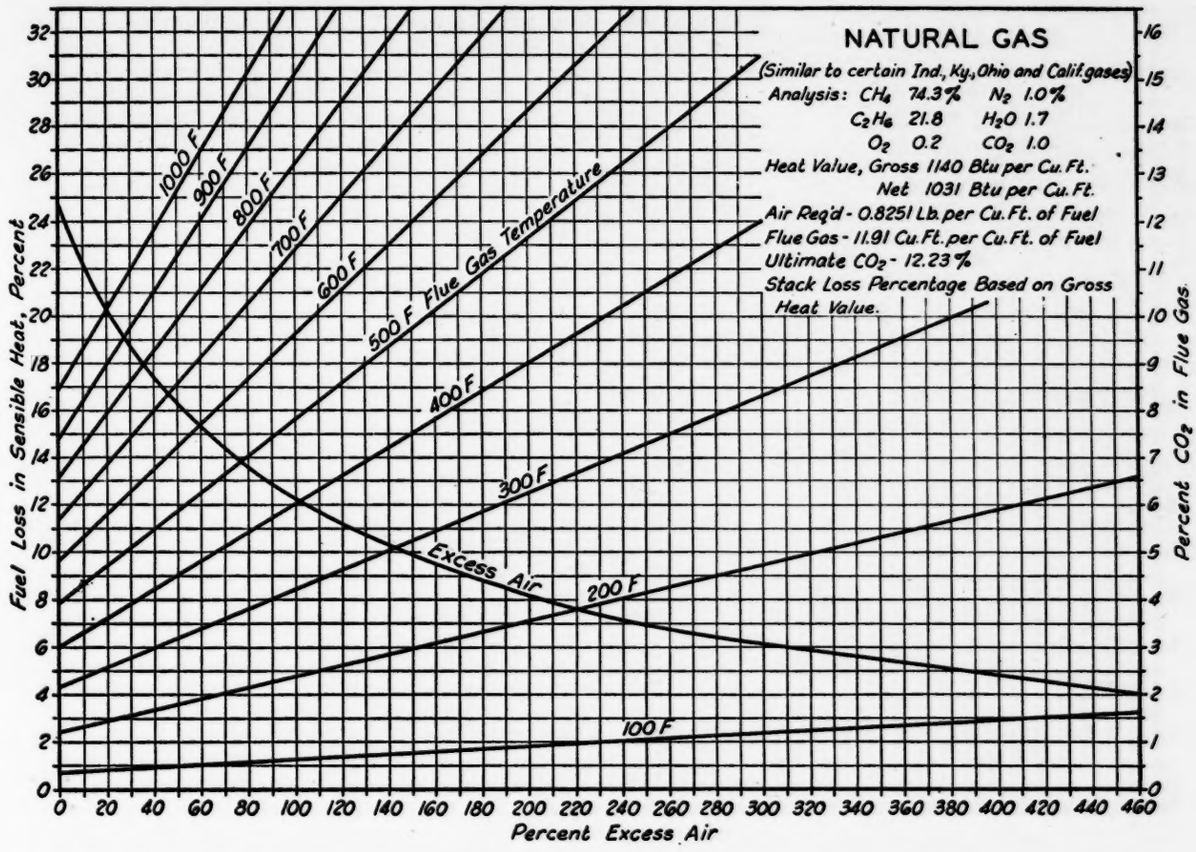


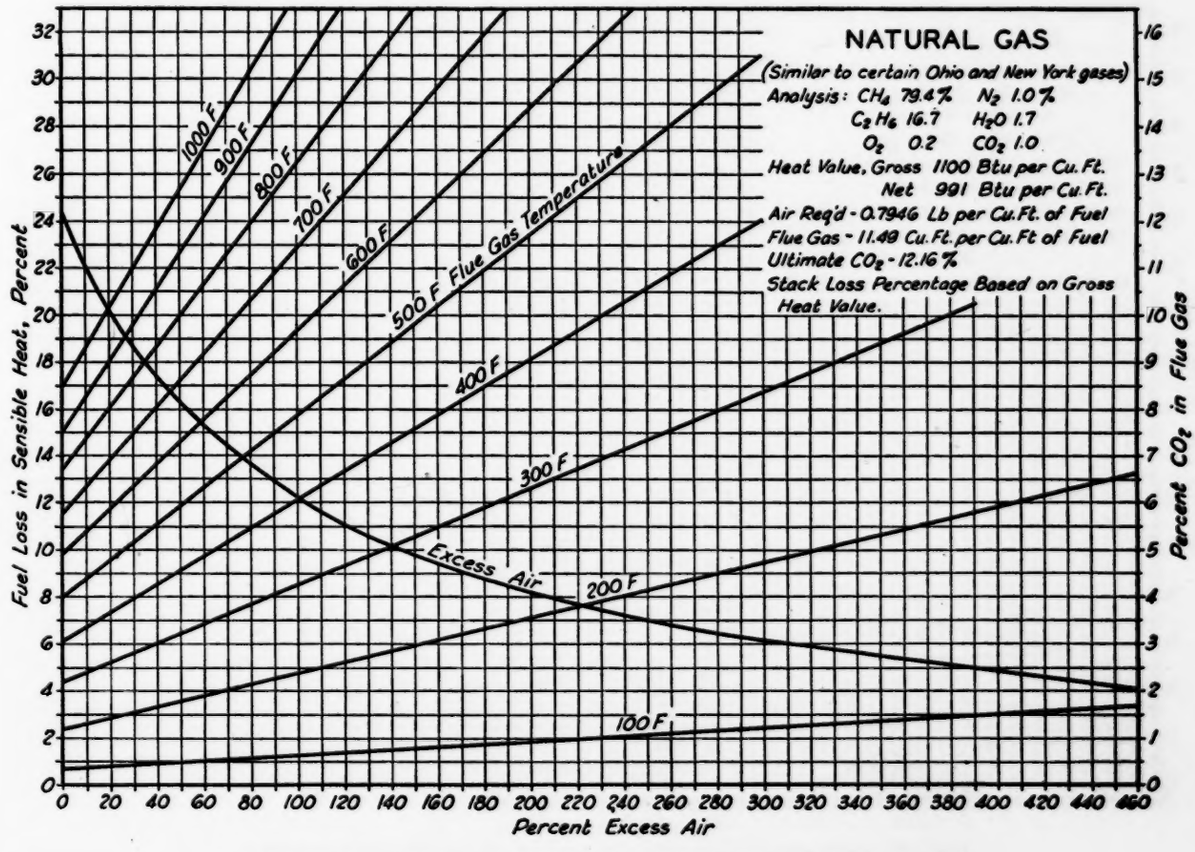
Photo taken with Schlieren optical system shows shock and air flow patterns around scale models.

Bind in

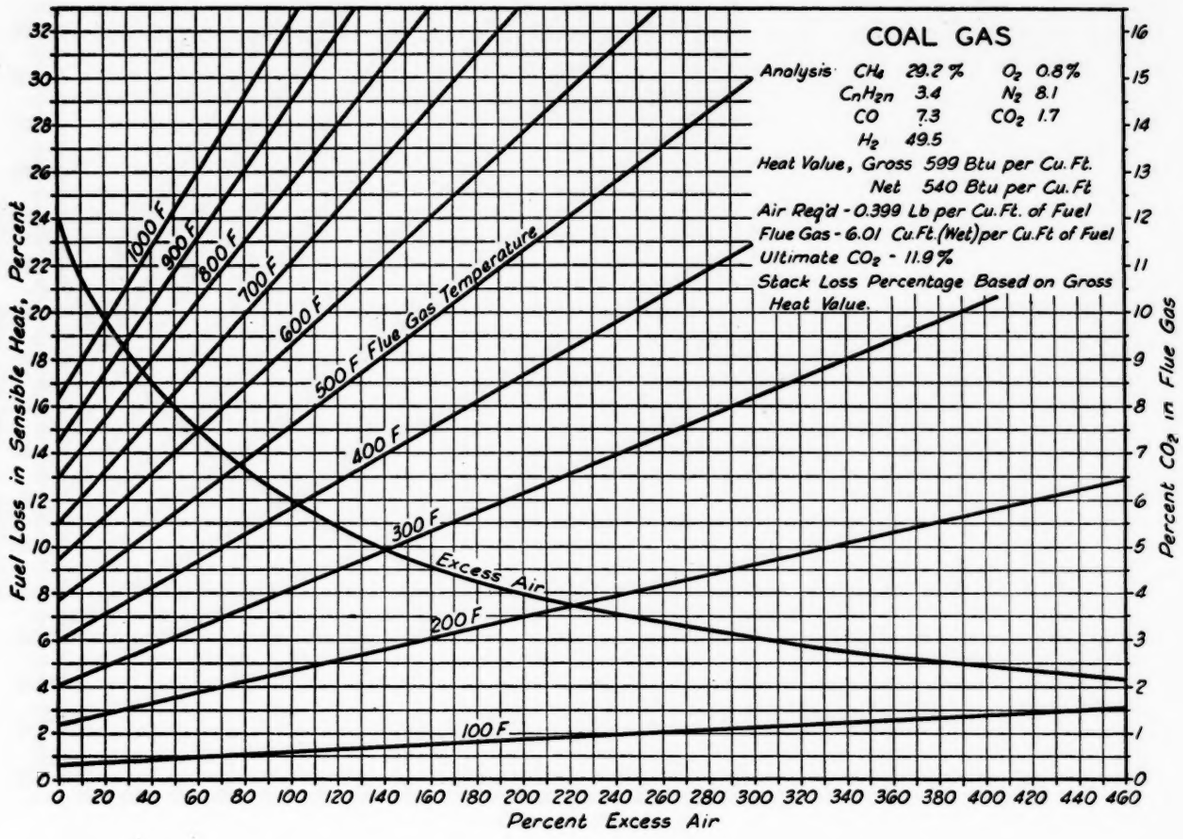
SENSIBLE HEAT LOSS IN FLUE GAS – NATURAL GASES

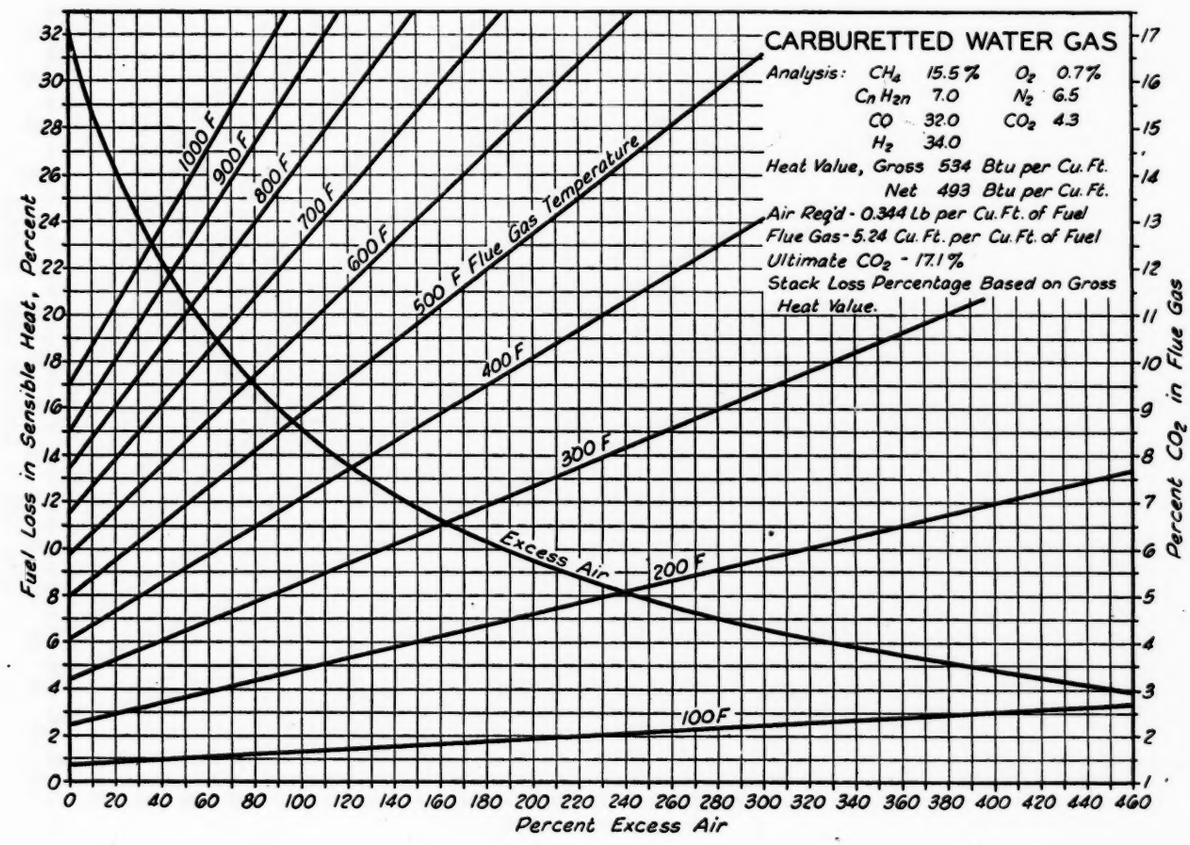
The accompanying charts are for determining the amount of excess air and the percent of sensible heat loss in the flue gas knowing the percent of CO_2 in the flue gas. The use of the charts is as described in the February, 1949 data sheet.


NATURAL GAS
(Similar to certain Ind., Ky., Ohio and Calif. gases)
Analysis: CH4 74.3% N2 1.0%
C2H6 21.8 H2O 1.7
O2 0.2 CO2 1.0
Heat Value, Gross 1140 Btu per Cu. Ft.
Net 1031 Btu per Cu. Ft.
Air Req'd - 0.8251 Lb. per Cu. Ft. of Fuel
Flue Gas - 11.91 Cu. Ft. per Cu. Ft. of Fuel
Ultimate CO2 - 12.23%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO2 in Flue Gas
Percent Excess Air


NATURAL GAS
(Similar to certain Ohio and New York gases)
Analysis: CH4 79.4% N2 1.0%
C2H6 16.7 H2O 1.7
O2 0.2 CO2 1.0
Heat Value, Gross 1100 Btu per Cu. Ft.
Net 991 Btu per Cu. Ft.
Air Req'd - 0.7946 Lb per Cu. Ft. of Fuel
Flue Gas - 11.49 Cu. Ft. per Cu. Ft of Fuel
Ultimate CO2 - 12.16%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO2 in Flue Gas
Percent Excess Air

HEAT LOSS IN FLUE GAS – MANUFACTURED GASES


COAL GAS
Analysis: CH_4 29.2% O_2 0.8%
C_nH_{2n} 3.4 N_2 8.1
CO 7.3 CO_2 1.7
H_2 49.5
Heat Value, Gross 599 Btu per Cu. Ft.
Net 540 Btu per Cu. Ft
Air Req'd - 0.399 Lb per Cu. Ft. of Fuel
Flue Gas - 6.01 Cu. Ft. (Wet) per Cu. Ft of Fuel
Ultimate CO_2 - 11.9%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
Excess Air
200 F
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air


CARBURETTED WATER GAS
Analysis: CH_4 15.5% O_2 0.7%
C_nH_{2n} 7.0 N_2 6.5
CO 32.0 CO_2 4.3
H_2 34.0
Heat Value, Gross 534 Btu per Cu. Ft.
Net 493 Btu per Cu. Ft.
Air Req'd - 0.344 Lb per Cu. Ft. of Fuel
Flue Gas - 5.24 Cu. Ft. per Cu. Ft. of Fuel
Ultimate CO_2 - 17.1%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
Excess Air
200 F
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

Air Conditioning Design Conditions for Various Industries

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Compilation of design conditions considered satisfactory for air conditioned rooms in industry. Part 3 covers controlled air conditions for textiles.

A NUMBER of reliable textile specialists were consulted as to design air conditions for the textile industry and as expected a variety of figures were obtained. Textile manufacturing is one industry that is dependent on controlled air conditions and it is one of the earliest industries to employ air conditioning. Table 10 lists conditions to be maintained in the manufacture of cotton, linen, woolens and silk.

Animal fibers best draw and twist by surrendering regain which accounts for the lower relative humidities maintained in spinning than in drawing.

The ultimate objective of processing textiles is the weight of material per given length. All machinery is mechanical and delivers a definite amount of stock per given length of time. Weight is influenced by the moisture content of the air surrounding the processed stock—namely, increase or decrease of regain.

Therefore, regardless of whether the textile fibers

TABLE 10—AIR CONDITIONS FOR TEXTILE MANUFACTURE
Prescribed by Source A

Room or Process	Temperature, F	Relative Humidity, %
Cotton		
Opening	75	55
Picking	75	55
Carding	75	55
Drawing	80	60
Roving	80	60
Ring Spinning		
Conventional	80 - 85	60 - 70[1]
Long draft	80 - 85	55[1]
Spooling and warping	80	65
Weaving	80	70 - 85[2]
Cloth room	75	65 - 70
Linen		
Carding	75 - 80	60
Spinning	75 - 80	60
Weaving	80	80
Woolen Processing		
Pickers	80 - 85	60
Carding	80 - 85	65 - 70
Spinning	80 - 85	50 - 60[3]
Dressing	75 - 80	60
Weaving	80 - 85	60 - 75[4]
Worsteds		
Carding	80 - 85	65
Combing	80 - 85	65 - 70
Gilling	80 - 85	65 - 70
Top storage	70 - 85[5]	75 - 80
Drawing	80 - 85	65
Cap spinning	80 - 85	50 - 55
Spooling and winding	75 - 80	65 - 70
Weaving	80	55 - 70[6]
Finishing	75 - 80	60
Silk		
Preparatory	80	60 - 65
Weaving	80	60 - 70

[1]Relative humidity maintained in ring spinning depends upon the staple, twist, and whether the spinning is long draft with leather aprons for conveying the stock. The aprons readily absorb moisture so that the cotton sticks to the aprons when 55% is the limit of the relative humidity. If conventional, 3- or 4-roll spinning is run, relative humidities can be as high as 70%, but that depends upon the draft, twist and staple.

[2]Relative humidity carried in cotton weaving depends on the cloth construction.

[3]Relative humidities to be maintained for the mules is generally 55%; conditions over frame spinning, 55-60%. Both types of spinning depend upon the class of stock spun, also the regain in the roving.

[4]Woolen weaving generally calls for 60% R.H. However, on heavy goods such as 32 oz overcoatings, highest production is experienced with 75% R.H.

[5]This depends upon whether cellar long period conditioning at low temperature or quick conditioning at high temperature is used.

[6]This depends upon staple quality and construction.

TABLE 11—AIR CONDITIONS FOR TEXTILE MANUFACTURE
Prescribed by Source B

Room or Process	Temperature, F	Relative Humidity, %
Cotton		
Opening and picking	75	50 - 60[1]
Carding	75	50 - 55[2]
Combing	75	60 - 65
Drawing	75	50 - 65
Roving	75	50 - 60
Spinning	75 - 80	50 - 65
Spooling	....	70
Weaving	75 - 78[3]	70 - 80
Warp tying	....	60 - 70
Cloth room	....	65 - 70
Laboratory	70[4]	65[4]
Woolens		
Bradford		
Carding	75	65 - 70
Combing	....	60 - 65
Drawing	75	50 - 60
Spinning	75	50 - 55
Weaving	75	50 - 55
French		
Carding	75	65
Combing	75	65
Drawing	75	70 - 80
Spinning	80 - 85	75 - 80
Weaving	75	50 - 55

[1]If air is recirculated and cleaned, then relative humidity should be 60%.

[2]It is essential in late fall, winter and early spring, particularly on windy days, to keep the relative humidity above 40%. Under dry conditions, the card is hard to start.

[3]Relative humidity can go as high as 90% when many automatic machines are to be tended and warps are heavily sized. In winter, temperature should be 75-78F; in summer, 83F at 90% R.H.; 85F at 80% R.H.; 87F at 70% R.H.

[4]Both temperature and relative humidity are held to ± 2.

are synthetic, animal or vegetable, controlled humidification is of great importance in the processing of such textiles.

All textile machinery generates static electricity. This is materially allayed by use of 50-55% R.H.

High relative humidities in the various processes also serves considerably to lay dust. This is attested to by the fact that in blue denim weave sheds, where weaving is done under low relative humidities, after one spends an hour's time in such a shed, there is a definite blue ring around the nostrils and lips due to dust. Such a condition is not experienced in these sheds when high relative humidities are maintained.

Data in Table 11 were obtained from another textile authority. In some items, they vary with the information given in Table 10, but a study of the two tables helps one to arrive at suitable average conditions.

Rayon

Rayon is a term that includes commercial cellulose products such as viscose, acetate, and cuprammonium. The yarns may be made from continuous filament or from cut staple. According to one authority, cut staple is processed under the same humidity conditions as cotton. Tables 12 and 13 list detailed information regarding rayon.

TABLE 12—AIR CONDITIONS FOR RAYON AND SYNTHETIC TEXTILE MANUFACTURE
Prescribed by Source A

Room or Process	Temperature, F	Relative Humidity, %
Viscose		
Preparatory	80	60
Weaving	80	60
Celanese		
Preparatory	80	70
Weaving	80	70 - 75
Nylon		
Preparatory	80	50 - 60
Weaving	80	50 - 60

More detailed information concerning the individual textile processes as applied to rayon is given in Table 13. It was obtained from another source with extensive textile experience.

A number of twisting and winding operations, called throwing, up-spinning, twisting, winding, coning, warping, copping and quilling is required to prepare rayon filament yarn for weaving or knitting. Air conditioning serves to condition the yarn so that it is workable at high speed with a minimum of breakages and irregularities.

Temperature, too, is important. It should be high enough to prevent hardness in the rayon and combined with adequate humidity to minimize static. During cool weather, temperature should be high enough to lessen the variations between cool and hot weather operation. Temperature is important in the weave room. Many of the troubles formerly attributed to variations in humidity are now known to be caused also by variations in temperature. A minimum temperature of 80F helps to prevent hardness in the yarn. Uniform pliability and tension are also favored by a fixed, uniform temperature. A moderate amount of humidity is looked upon as insurance against static.

TABLE 13—AIR CONDITIONS FOR RAYON MANUFACTURE
Prescribed by Source B

Room or Process	Temperature, F	Relative Humidity, %
Throwing	80[1]	55 - 65
Picking	----	50 - 60
Carding, drawing, roving	80 - 90	50 - 60
Spinning	80 - 90	50 - 60
Weaving		
Regenerated rayons	80	50 - 65
Acetate	80	55 - 60[2]
Spun rayons	80	80[3]
Knitting		
Viscose or cuprammonium type	80 - 85	65
Acetate	80 - 85	70

[1]There is a growing tendency to increase the humidity and some manufacturers have tried 65% R.H. with satisfactory results. In the South, a minimum temperature of 85F is preferred.
[2]The minimum range of relative humidity is 55-60% and the maximum, 70-75%.
[3]Maximum condition.

The A.S.T.M. has standardized testing and laboratory conditions at 70F and 65% R.H. based on four hours exposure.

Knitted Wear

Recommended relative humidities for knitting mills is given in Table 14.

For knitting nylon, a relative humidity of 48% is recommended. If relaxation of the yarn is a problem, then 70% R.H. should be maintained.

The relative humidity percentages of Table 14 are based on a temperature of 70F.

According to U. S. Government tests, when the relatively humidity of the air is over 45%, static cannot exist. This allows material to run freely on high speed machinery without the danger of jumping due to electrification. When the yarns run moist they are pliable and tend to run without cracking off of the small fibers.

Rust will not set in when the atmosphere is kept under 70% R. H. Relative humidity can be kept well below this figure and still high enough for better working of the yarns. The change over from haphaz-

TABLE 14—RECOMMENDED RELATIVE HUMIDITIES FOR KNITTING MILLS

Area	Textile		
	Wool	Cotton	Rayon
	Relative Humidity, %		
Stock, storage	65	60	55
Warping	65	60	55
Winding	60	60	55
Knitting	65	68	60

ard atmospheric conditions to controlled air conditions is claimed to lessen the amount of breakages and seconds in a mill at least 25%, and the productivity of the mill increased from 3 to 8%.

Glass Yarn

In the manufacture of fiber glass strands which form the basis of fiber glass yarn, small glass marbles are melted in an electric furnace. Diameter of filaments produced are controlled by the temperature of the molten glass and the speed at which the filaments are drawn.

The very fine filaments are passed through a spray of a special lubricant and then through a metal V-shaped notch that draws the fibers into a single strand. The lubricant oils the filaments and serves as a temporary binder to make the filaments adhere to each other in subsequent fabricating processes. The single strand that is formed is drawn to a high speed winder. These strands are so fine that at least two strands are twisted together to form a thread suitable for weaving. The strands are twisted to form yarn which is then wound on cones for shipping.

Where the continuous filaments are produced, it is necessary to maintain a temperature of about 75F and a relative humidity of 65% to prevent the lubricant from drying too rapidly. It is also necessary to pass large amounts of air through this room to carry away the heat given off by the electric furnaces. Temperature on the electric furnace floor is maintained at about 85F.

(To be concluded)

Heaters Disperse Fog in Pipe Works

Engineers at the Aliquippa Works of Jones & Laughlin Steel Corp. have found a way to "de-fog" the mill's pipe pickling and galvanizing shop. They use four large air heaters which create a warm air "blanket" in the area immediately above acid dipping vats and reduce the condensation rate of vapors.

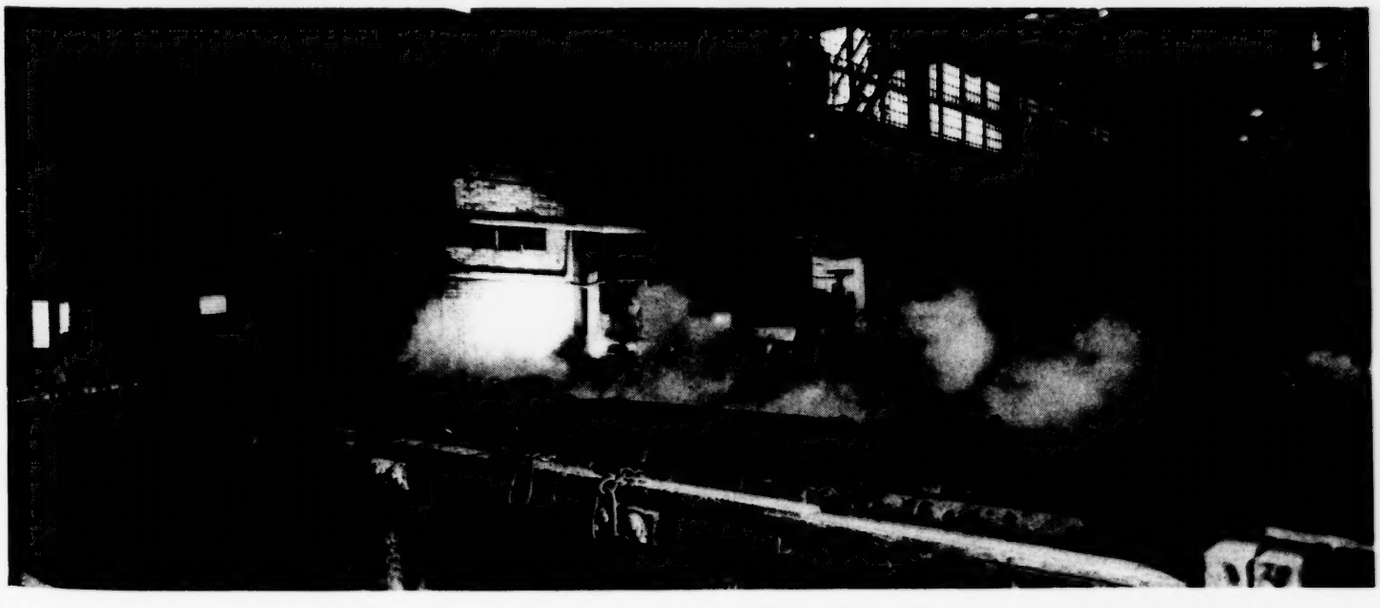
In the past, condensation of vapors rising from ten 3000-gallon tanks charged with heated acid, had so obscured visibility during cold weather that it became necessary at times to stop production. A craneman in his cab 18 ft overhead could not see the floor, and workmen had to grope their way through the dense atmosphere.

The building was unheated except for a few small gas- and coke-fired salamanders. Cold air entered through a constantly open truck door and infiltrated through other apertures. Although the fumes are nontoxic because an inhibitor is used in the solution, the fog did constitute a safety hazard and slowed metal-treating operations.

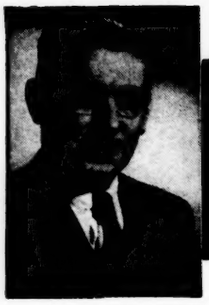
The equipment selected by Jones & Laughlin to solve the problem is a development of Dravo Corp., Pittsburgh. Four Counterflo heaters, each having a capacity of 2,000,000 Btu per hr, were installed in metal lean-to sheds outside the south wall of the pickling shop. Each heater handles about 22,000 cu ft of outside air per minute.

After the fresh air passes over economizer tubes, it sweeps the heater's stainless steel combustion chamber and then is discharged into the pickling shop at a velocity of approximately 2000 fpm through wall openings 12 ft above the floor. Only six of the 13 bays in the building are covered by the fog-dispersing heat blanket, but these are the important ones where the acid tanks are situated.

The hot vapors rising from the tanks now meet air of almost equal temperature and the amount of condensation and resulting fog has been reduced considerably. There is no fog problem with the four rinse and two cold dip tanks also located in the building.



Warm air discharged at high velocity through wall openings, blankets area above tanks and reduces fog



Experience is my Classroom

By T. W. REYNOLDS

• OIL TANK PIPING

A correspondent in Philadelphia refers to some sketches of tank piping in this department in the November, 1948 issue of HEATING AND VENTILATING and writes as follows.

"I have been in the oil business in all phases for almost thirty years and have been responsible for piping up thousands of 275 gallon tanks, both single and twin installations. I also have been in the oil delivery end of the business for about as long.

"This long experience tells me that twin tanks equipped with a manifolded fill are a serious source of trouble from many angles to both customer and oil supplier from leakage and squabbles about amount delivered and choked vents and damaged oil gages and spurting vents and slow fills. For many years we have always run separate fills and twinned the vents.

"I also note the recommendation that supply to burners be opened at time of filling. First, this is bad practice because filling stirs up any sludge in the bottom and, secondly, 75% of the tanks are filled today by ventalarms with no one going into the basement. Frequently no one is home to open lines to burners. Then again most burners operate automatically and oil flows from the tank when the pump runs and valves at tank are always left open.

"I don't think it reflects any credit to give this kind of misleading information. Domestic oil burner practice is entirely different from commercial and industrial and only those experienced in domestic practice are competent to instruct us."

The foregoing communication does not lack for either vitality or confusion, as the reader can well judge for himself. It objects to the *opening of valves* at the time of filling, which is not quite what I said; nor was there any *recommendation* made, only my *own belief* on a matter which was being discussed in New York City to the effect that valves be *left open*. The correspondent himself, while voicing disagreement, seems elsewhere to agree, since he writes that valves are always left open. So the sludge will be stirred up anyway.

He then goes on to add that frequently no one is home, which is just what happens in my own home where neither the driver nor my wife bother about valves, and when no one is home the driver isn't going to go away without making delivery. I know that it is said valves should be left closed, but somehow I have never had the trouble from sludge and, further, the conditions as cited seem to be that they actually are left open elsewhere.

It was my intention to do a bit of constructive work in reporting on the discussions within New York City after consulting competent authorities. Everything in this vicinity is as stated, there is no misleading, and should we know less in New York City than in Philadelphia about these matters it could be because two tanks have not been allowed here until recently, hence our experiences along these lines have been brief.

I rather think that the oil burning interests should get together and set up a standard practice so that we less informed become better informed. No two experts within the same company seem to agree and in this connection I like to think back to the time when I sat on the Board of Examiners for the granting of licenses to install both *domestic* and *industrial* oil burners at the time the law was first passed in New York City.

We examiners found that the ruling heads of the dealers flunked their exams while service men passed. If we did not know enough to justify being in our position, it was equally apparent that the dealers were just as uninformed. The new law created a healthy situation, however, and many dealers, including ourselves, found that there was more to the subject than was commonly thought. It just seems that the experts have had such different experiences and also that full experience is not to be had in any one individual. The imposing list of troubles presented by the correspondent, at least in part, occur whether or not tanks are twinned together. For example, in my own home, a second tank being recently installed, it was found easier to run a separate fill, yet the oil gage was damaged. The second tank is at a different elevation, so that valves were installed by the dealer to run on only one tank at a time.

• MISLEADING GAGE GLASS

When you see the water dancing up and down in a gage glass on the steam boiler it's a fairly safe proposition that the boiler water is dirty, but if any argument arises on the point, don't bet any money on it. I have seen such a nervous water line in the gage glass on a round boiler and the only trouble was the connecting of the glass too near an active nipple port. Things were severe enough inside the boiler, but the glass was flooded and false as to water conditions.

Recently, there was a troublesome gage glass on a cast iron boiler of a type which was over fired with oil. The glass did not flood, it just emptied, and in a sense its reading was not false as to trouble at its location, otherwise the automatic low water cut-out would not be forever cutting out the oil burner. There is much more of heating surface in the front section

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

of a cast iron boiler than there is in its intermediate sections and there was more radiant fire at that point. As a consequence, circulation and pressure generation was most active in this first section, so that water left it to go to the rear section where pressure was less.

A steel boiler may show a steadier water line than a cast iron boiler does on the same job, particularly where there is evidence of carryover to the system. The gage glass in the steel boiler is located farther away from the point where water leaves the boiler, hence it shows a truer condition of boiler water line location.

• SHOULD ENGINEERS GUARANTEE PERFORMANCE?

The phone rings and the party on the other end wants to know if I have ever heard of an engineer being asked to guarantee his work. Now, I have heard of some contractors guaranteeing performance and possibly a combination of contractor-engineer could do likewise, but as for consulting engineers, never. An engineer is licensed, of course, but this guarantees nothing. The license is a mere statement that certain requirements have been fulfilled and that one is therefore qualified to practice. Anyhow, it would be a lawyer who would think of asking such a thing as a guarantee, yet a lawyer is himself vulnerable in this respect and guarantees nothing in his own work. He argues the case and you win or lose and often in reality lose when you win.

What do other professional men do in respect to the subject question? Well, the dentist may tell you that the tooth won't hurt once it is out, but he won't guarantee that the void left behind won't hurt. As for the surgeon, he won't guarantee or sign anything, but you do; you sign a form or affidavit protecting him from any consequences. No professional man guarantees anything, yet lawyers, doctors and dentists have gone to jail for unethical practices, and I suppose there have been engineers, too.

Why, then, should not the professional man guarantee his work? No doubt he does not because his services are of such a nature that control of conditions is not insured. For example, a housing development is blown up from a gas leak and several tenants are killed, or a heating system is improperly installed or operated, or a patient does things contrary to a doctor's orders and kills himself. No, a guarantee of performance seems to be a manufacturer's or builder's function.

An engineer may design a machine, but if he builds it he is no longer a consulting engineer or a professional man. Even with manufactured items, there remain limitations of the guarantee over any conditions beyond the control of the manufacturer. A cast iron radiator, for example, could be guaranteed against a much higher steam pressure if the manufacturer knew that the system would not be installed so as to collect condensation and multiply steam pressures through the action of water hammer.

• CHIMNEY CLEAN-OUTS NEEDED WITH GAS APPLIANCES

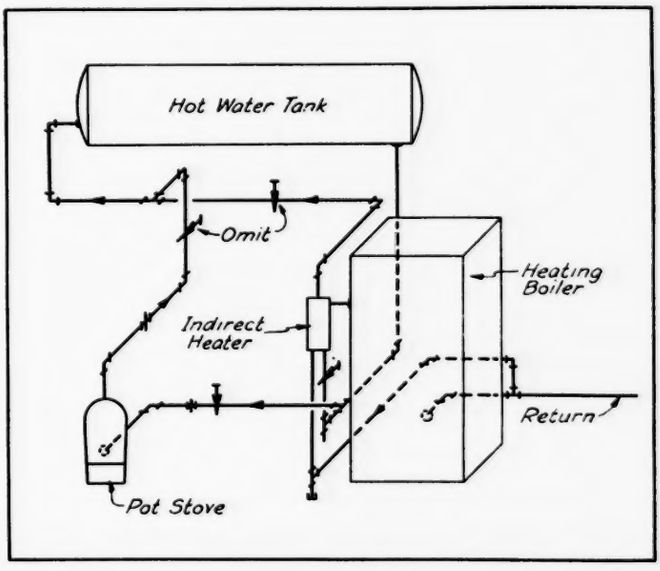
Occasionally there is a bit of confusion as to the need for a clean-out door in a chimney serving any appliance which burns such a clean fuel as gas, but how else could one clean out the bits of falling mortar and brick, especially where the chimney base is too close to the flue entrance? Aside from this requirement, all major cities do have building codes which require a clean-out for each flue, because the code compilers recognize that some day a different owner or boiler may be in the building and using a fuel other than gas.

• VALVING POT STOVES

Whenever I go down to my rumpus room (cellar) and notice that drab, squat piece of cast iron called a pot stove, I am inclined to quicken my pace past this potential source of danger. This inhibition comes about because of a pot stove of which I heard and which chose to explode during the last war just as the owner stepped behind the protection of the adjacent heating boiler. On the wall close by was a group photo of the owner's son and some fellow soldiers in the Pacific. In the group next to the owner's son stood the only one to receive some of the pot stove shrapnel, and who one week later was the only one to die overseas from a burst of enemy shrapnel.

As for the pot stove, it was valved in a very dangerous but not too unusual manner, as shown in the accompanying sketch, and would not have exploded had its valves been operated properly. Of course, the purpose of the four valves as shown is to close off either of the two heaters if one is to be laid up for a while and so to prevent the pot stove heater from unnecessary heating of the boiler or the indirect heater from wasteful heating of the pot stove.

Always inherent in such an arrangement is the possibility or probability that someone will fire up the innocent looking little scuttle-a-day pot stove, not remembering to open its set of valves. When this happens, the stove is thereby loaded for ultimate explosion, unless provided with a relief valve between stop valves, and not always even then. Better than the relief valve is the use of only one valve. This is all that is necessary to provide expansion for heated water and stop cross circulation between heaters. With a single heater, no valves at all are required, unless one desires to remove a heater with greater ease.

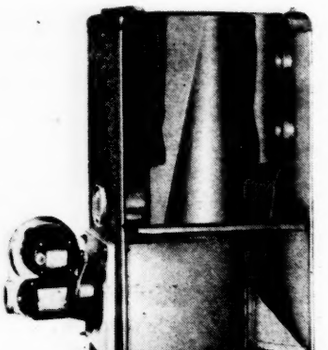


Piping and valving around a pot stove.

NEWS OF EQUIPMENT AND MATERIALS

Com-Fort Furnace

NAME—Com-Fort furnace.
PURPOSE—Furnace for installation in basement or utility room for space heating with interchangeable oil-fired or gas-fired burners.
FEATURES—Three types of burners



are available: pressure atomizing type oil burner, vaporizing type oil burner, or a gas burner. Each is assembled with a standard size mounting plate with four bolt holes so that it is simple to remove one burner from the furnace and replace it with one of another type. A conical combustion chamber design provides heating surface parallel to the burner flame. The pouch of the heat exchanger and the inspection tube project through the front wall of a cabinet, thereby eliminating, it is said, any chance of combustion products leaking into the inside of the cabinet through which the air is circulated. Burner mounting plates are provided with an asbestos rope seal between the mounting plate and the heat exchanger pouch. The blower access door is located in the front panel of the cabinet for easy access. Horizontal baffle-plates are located high above the blower discharge to reduce internal resistance to air flow and to direct the air over all surfaces of the heat exchanger which is supported in the assembly by being bolted to heavy gusset plates in the corners of the cabinet. The blower is mounted on rubber pads for quiet operation. The return air connection may be made on either side of the unit in the back panel, or the unit may be installed so that the return air is taken up through the bottom of the cabinet.
SIZES AND CAPACITIES—Unit is 66 inches high to provide ample room for a plenum chamber to be installed above the cabinet. It occupies a floor space 25 by 25 inches.
MADE BY — *Comfort Equipment Corp., 914 S. Michigan Blvd., Chicago 5, Ill.*

Item 245

Auburn Unit Heater

NAME—Auburn suspended oil-fired unit heater.
PURPOSE—Space heating for warehouses and other places where floor space is at a premium.
FEATURES—Heat travels in a stainless steel combustion chamber and then through baffled double radiators. Flange mounted pressure burner is used with two-stage

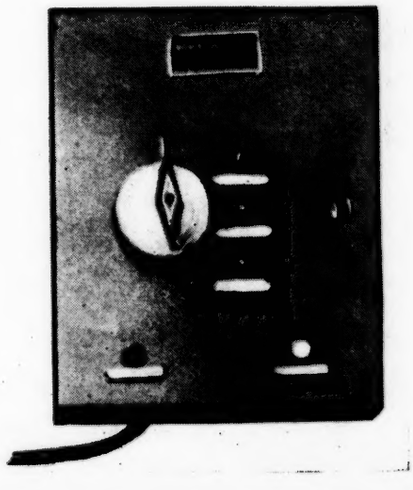
pump. An observation window is installed for inspection of flame. Four clean-out plugs provide accessibility. The burner, fan, and all controls are mounted and wired with flexible conduit ready to mount. The only installation work required is connecting oil line, piping to chimney, and connection to source of electric current. Two large warm air outlets placed one on each side, can be provided with or without straight or 90-deg louvers. Either a propeller type fan or a squirrel cage type blower is used, operated by a ¼ hp motor.
SIZES AND CAPACITIES—The propeller type fan models are available in four sizes with output of 150,000, 190,000, 240,000 and 300,000 Btu, and cfm capacities, respectively, of 4100, 4100, 6000 and 6000. There are five sizes in which the squirrel cage type blower is used with Btu outputs from 80,000 to 300,000 and air delivery from 1,100 to 3,400 cfm. In the small size a 10-inch blower wheel is used; the large size, 16-inch.
LITERATURE AVAILABLE—Leaflet.
MADE BY — *Auburn Burner Co., Auburn, Ind.*

Item 246

Magic Dial Control

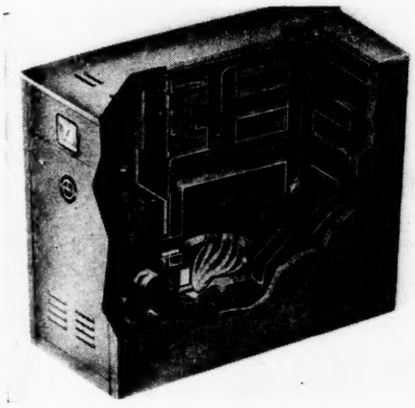
NAME—Magic dial control system.
PURPOSE—Central control system for air conditioning units.
FEATURES—The system is controlled by a rotary switch in the master control cabinet. This switch needs to be turned to one of four positions such as off, fan only, cooling, and heating, for automatic operation. Installation and servicing are simplified by the use of standardized instruments and a numbered wire. The master cabinet has terminal blocks numbered to correspond with the numbers on each of the other 13 instruments in the system. Every inch of wire is imprinted with the same number as the terminals to which it is connected. A wide variety of instruments can be controlled from this one central master cabinet.
MADE BY—*Midwest Automatic Control Co., 510 Third St., Des Moines, Iowa.*

Item 247



Percoflash Boiler-Burner

NAME—Percoflash boiler-burner.
PURPOSE—For space heating in the

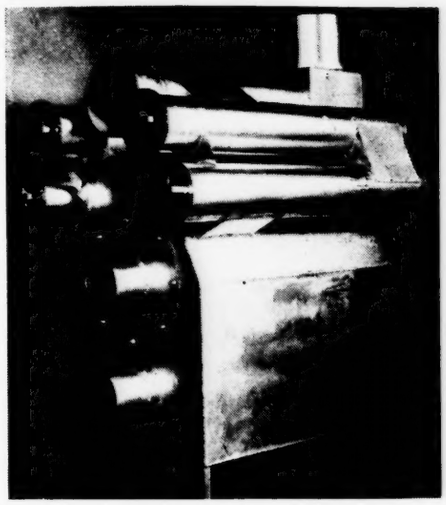


small home and for use where space is limited.
FEATURES — The percolator principle is employed to provide virtually instantaneous circulation of steam or hot water through geysers for flash heat action. The tubeless design eliminates the need for cleaning boiler tubes. Percolator geysers raise heated water to each heating head in the steam boiler; provide accelerated circulation in the hot water boilers. Sediment is raised to a well or sump in the upper head where it can be removed by an occasional flushing. Unit has a removable combustion chamber, optional tank or tankless hot water heater, aquastat water temperature control, and a low water cut-off. Combustion chamber and oil burner are assembled as a unit. It is also available for gas or stoker operation, and for steam or hot water systems.
SIZES AND CAPACITIES—Available in four sizes to serve from 350-850 sq ft radiation (steam); 560-1360 sq ft (water).
LITERATURE AVAILABLE—Bulletin.
MADE BY — *Westcott-Alexander, Inc., Dept. N, Madison, N. J.*

Item 248

Norwalker Furnace

NAME—Norwalker air conditioner.
PURPOSE—Warm air space heating.
FEATURES—Circulation of cool air between interliner and cabinet walls of unit is said to provide positive insulation against furnace heat penetration. A Lau blower is used operating at moderate speed and sized to facilitate adjustment of the completed installation for continuous air circulation. The heat generator is constructed with a down-draft flue gas passage designed to eliminate any combustion rumble. This feature applies to the size units from 75,000 to 325,000 Btu. For sizes 450,000 Btu and larger, the heat generator is constructed as illustrated. Five tubes provide better than 300 inches of flue gas travel. Tubes are easily cleaned by the removal of cleanout caps. Burner is of the high pressure type and is supplied with G-E motors, Sundstrand or Webster pumps and Minneapolis-Honeywell or Mercoid controls. Filters are of the spun glass type. A humidifier, with absorbent pads, is supplied.
SIZES AND CAPACITIES — Models ranging from 75,000 to 265,000 Btu

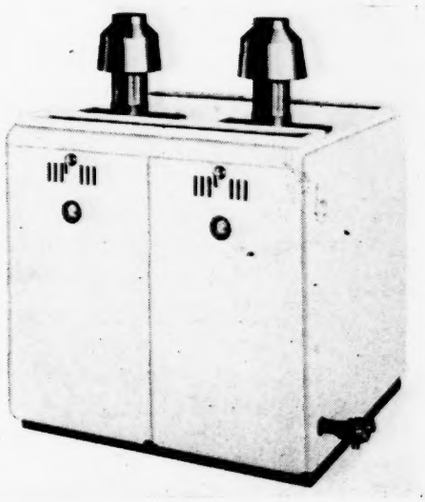


per hr at the register and in special sizes up to 1,000,000 Btu.
LITERATURE AVAILABLE—Illustrated folder.
MADE BY—*The Norwalk Airconditioning Corp., 138 Water St., S. Norwalk, Conn.*

Item 249

Richmond Twin Conditioner

NAME — Richmond gas winter air conditioner—twin type.
PURPOSE — Space heating by twin units operated by one set of controls.
FEATURES — Fan and limit control switch starts the blower circulating when the plenum air temperature reaches a predetermined setting and stops the blower when a limit temperature is reached. A safety



pilot control prevents the flow of gas to the main burners when the pilot is extinguished. It consists of a pilot burner, thermocouple and electric switch. A gas pressure regulator maintains proper gas pressure at the burner. Cast iron raised-port type gas burners are used to obtain uniform flame distribution. Two resilient cradle mounted motors with integral thermal overload protection operate at 1,725 rpm. A centrifugal type blower is used, dynamically balanced. Filters are of the glass wool replaceable-type. A rear access panel permits ready servicing for motor, blower and filters. The flue collecting chamber and the cast iron combustion chamber are surrounded by a circulating air stream which absorbs heat from the heated cast iron surfaces. The heat exchanger and flue collecting chamber are joined by sealing rings and asbestos gaskets.
SIZES AND CAPACITIES—Available in three models with Btu input of 180,000, 230,000 and 280,000 Btu, and an air delivery at 0.2 inch pressure and 80F temperature rise; output, 1,620, 2,070 and 2,520 cfm. Two ¼ hp motors are used in this unit.
LITERATURE AVAILABLE — Folder GW49-1.
MADE BY—*Richmond Radiator Co., 19 E. 47th St., New York 17, N. Y.*

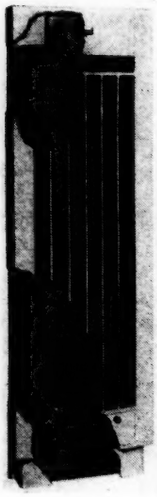
Item 250

Bryant Panel Heater

NAME—Bryant model 401 gas-fired radiant panel heater.

PURPOSE—Gas-fired unit for installation in walls.

FEATURES—The flue adapter has provisions for connecting to round or oval vent pipe. The heat exchanger is constructed of welded steel and has a ruffled porcelain enameled front to increase its radiating capacity. It is separated from the wall and cabinet by multiple air spaces. The cast iron burner has drilled multiple ports. A draft diverter is entirely enclosed by a cabinet. A Bryant model H pilot is available for automatic operation and a 100% shut-off pilot is used for low pressure gases. The burner and all controls are enclosed in metal and the front access door facilitates lighting.



SIZES AND CAPACITIES—Units are available for natural, mixed and manufactured gases, with input capacities of 15,000, 20,000 and 25,000 Btu per hr. One standard size cabinet is used for all models. Heater is available with either manual control or automatic type control.

LITERATURE AVAILABLE—Folder.

MADE BY—*Bryant Heater Co., 17825 St. Clair Ave., Cleveland 10, Ohio.*

Item 251

Transaire Transmitter

NAME—Taylor Transaire.

PURPOSE—A force-balance type of pneumatic temperature transmitter designed for applications where it is desirable to have a record or control remotely located from the point of measurement.

FEATURES—Instrument is responsive where pneumatic temperature transmission can be used advantageously and when the distance between point of measurement and location of recording or controlling mechanism is 50 ft or more. Unit employs the force-balance principles with an output in pounds per square inch proportional to the temperature of its thermal element. By means of a ¼-inch copper tube this pressure can be transmitted to a remotely placed receiver as distant as 1,000 ft. Thermal elements contribute to the high speed of response. Thermal systems are built to withstand overrange temperatures up to 1,000F. Instrument provides compensation for barometric and ambient temperature changes. Unit has an interchangeable assembly so that overall operating limits of the instrument can be changed. Speed-Act, a measurement technique, is said to overcome the lag inherently present in the response of a thermal measuring

element. Unit is fully encased to provide protection from dust.

LITERATURE AVAILABLE — Bulletin 98140.

MADE BY—*Taylor Instrument Companies, Rochester 1, N. Y.*

Item 252

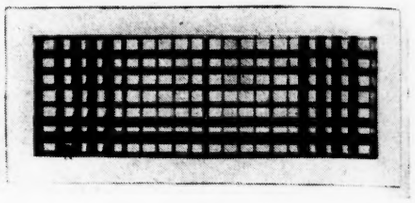
Titus Grille

NAME—Titus Airfoil, series 270.

PURPOSE—Grille for directing air flow.

FEATURES—Unit has two banks of louvers, each having a special streamlined design. The louvers are made from extruded material with no sharp corners and are individually adjustable. Set on ¾-inch centers, each louver creates any pattern desired for individual requirements. The two banks of louvers were designed to provide four-way directional control An air-tight rubber gasket prevents air leakage around the unit. The front blades of the grille are parallel to the short dimension while the rear blades are parallel to the long dimension.

SIZES AND CAPACITIES — Available



in sizes from 8 x 4 to 60 x 18 inches.

LITERATURE AVAILABLE—Bulletin.

MADE BY — *Titus Manufacturing Corp., Box 591, Waterloo, Iowa.*

Item 253

Autocon Silencer

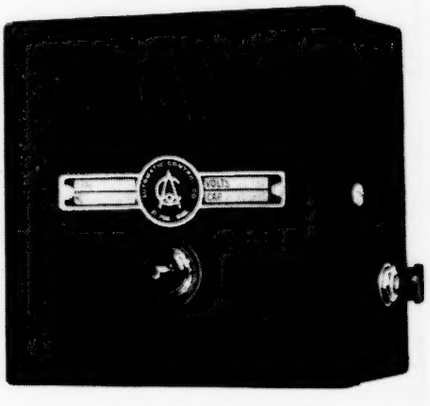
NAME—Autocon alarm silencer.

PURPOSE—To eliminate the danger of forgetting to close manually operated alarm circuits.

FEATURES—Silencer may be used with any type electrical alarm circuit that is used to indicate emergency conditions such as pressure, liquid level, temperature, etc. It is designed to provide continuous protection even though the warning sound that is part of the circuit is stopped. When emergency conditions arise the alarm can be stopped by pressing a button on the side of the silencer case. A red light remains on until the trouble is corrected. When the circuit is clear, the unit automatically resets itself and the light goes out.

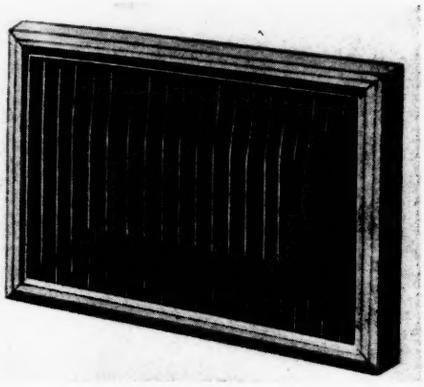
MADE BY—*Automatic Control Co., 1005 University Ave., St. Paul, Minn.*

Item 254



Electriglas Panel

NAME—Electriglas radiant heating panel.
PURPOSE—Space heating.
FEATURES—The heating element is a plate of 16- x 24-inch tempered

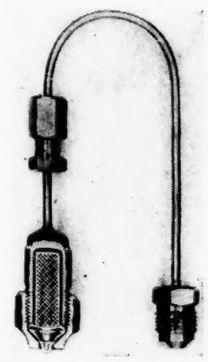


glass on which is fused a metallic alloy grid. This panel, which is said to be about five times stronger than ordinary glass, is mounted on an aluminum reflector plate 16½ x 24¾ inches. It is hinged on to the back section of a two-part steel outer frame. The entire panel is enclosed by the front section of this frame. When mounted, the frame projects only 1⅜ inches from the wall to provide the appearance of a flush installation.
SIZES AND CAPACITIES—Overall size, 19⅜ inches long, 26⅝ inches wide, and 1⅜ inches deep. Voltage, 110 to 120 a-c or d-c and 220 to 240 volts a-c or d-c. Amperage, respectively, is 9 and 4.5.
MADE BY—*Appleman Art Glass Works, Bergenfield, N. J.*

Item 255

Allin Capillary Tube

NAME—Allin capillary tube.
PURPOSE—To provide a quick and simple method for adjustment of refrigerant flow to any load condition within the range of the tube.

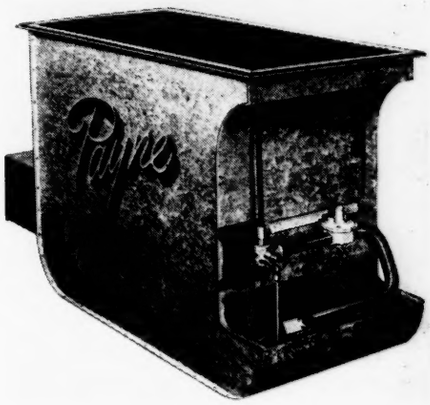


FEATURES—The unit avoids the cutting of ordinary capillary tubing to specific length for a particular refrigerant. Two sizes cover the range from ¼ to 1 hp units. Tube is silver soldered at each end and standard fittings are provided to minimize the connection time. A monel screen of 150 mesh and large area is provided for protecting the expansion orifice. Due to design of compression fittings and sleeve, the orifice is a straight-through design. Both sharp bends and excess tubing are eliminated.
MADE BY—*Allin Manufacturing Co., Chicago 22, Ill.*

Item 256

Payne Floor Furnace

NAME—Payne Compact floor furnace.
PURPOSE—Space heating.
FEATURES—Heating element is of the sectional type and is die-formed of rolled steel. The lighting door permits lighting the pilot with the floor grille left in place. The inner



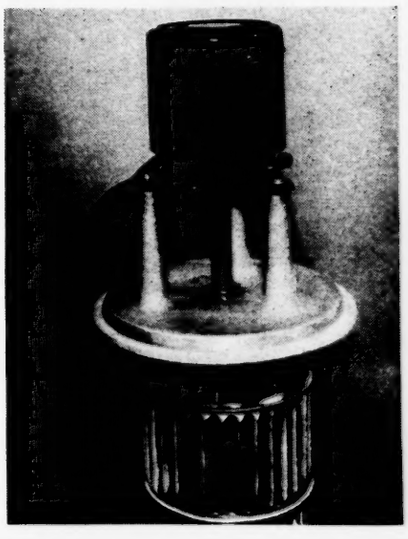
casing is insulated with aluminum-foil-coated corrugated asbestos. The curved vane design of the register causes the air to be projected horizontally and away from the wall approximately 2 ft before curving upward. A single manual valve controls both the pilot and the main burners. A safety lock prevents the user from opening the main burner valve before the pilot is turned on. Automatic thermostat controls and/or 100% safety pilot can be added to the manual control model without special fittings. The water-tight lower casing is said to provide protection against floods; in the event that flood waters do rise to reach the unit, the casing can be drained and furnace restored to operating condition by working from above the floor. Floor grille is made with 14-gage round edge bars with all corners welded.
SIZES AND CAPACITIES—Available in four sizes ranging from 30,000 to 75,000 Btu input capacity and available either with a flat floor grille or a duplex register model.
MADE BY—*Payne Furnace Co., Beverly Hills, Calif.*

Item 257

Magic Wheel Circulator

NAME—Magic Wheel circulator.
PURPOSE—Circulator for warm air furnaces in homes.
FEATURES—Circulator is installed in the bonnet of the furnace and is designed to draw the incoming furnace air over the hot crown of the fire-box before circulating it to the air ducts. It is said to be adequate for installations using as many as 11 ducts. Unit is powered by a 1/25 hp motor which is completely sealed against dust entry. Unit is thermostatically controlled with the fan switch set to start at 150F and to shut off when the bonnet temperature drops 10% below this setting after the fire has been dampened or shut off.
SIZES AND CAPACITIES—Designed to move 250 cfm of air at 70F.
LITERATURE AVAILABLE—Folder.
MADE BY—*Bazley & Schumaker Engineering Co., Colorado Springs, Colo.*
DISTRIBUTOR—R-W Sales Co., P.O. Box 141, Colorado Springs, Colo.

Item 258

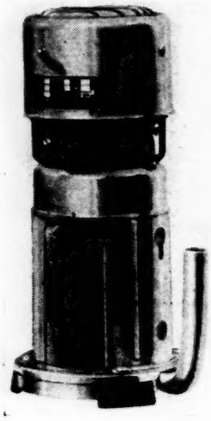


DIGITIZED BY THE INTERNET ARCHIVE

Thermador Pump

NAME — Thermador recirculating pump No. P-1.

PURPOSE—Pump for operating at low head and low capacity.



FEATURES — Unit is powered by a 1/35 hp motor which is an enclosed, shaded 2-pole type operating on 115 volts, a-c, 60 cycles, at 3,100 rpm. Unit is recommended for evaporative coolers and similar applications.

SIZES AND CAPACITIES—For pumping 7 2/3 gpm against a 2-ft head or 2 2/3 gpm against a 10-ft head.

MADE BY—*Thermador Electrical Mfg. Co., 5119 District Blvd., Los Angeles 22, Calif.*

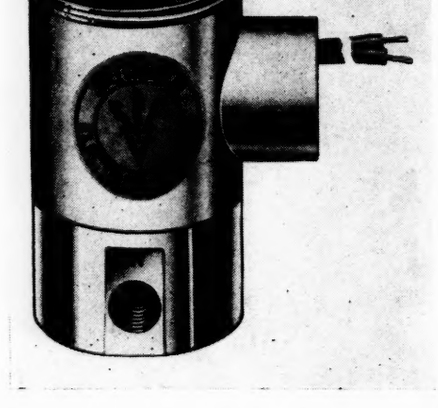
Item 259

Skinner Solenoid Valve

NAME—Skinner solenoid valve.

PURPOSE — Solenoid valve for oil burner applications to function as cut-off valve and also as pressure relief valve.

FEATURES—Valve is installed between the burner pump and nozzle and is designed as a cut-off valve to eliminate after-drip to the oil burner nozzle when the burner shuts off. Valve can be mounted in any position. It can also serve as a pressure relief valve to instantly relieve pressure on the oil burner pump when the burner shuts off, and to bleed the oil remaining in the pump to the return side of the pump or oil burner return line. It is installed on the pressure side of the oil burner pump. An advantage that is claimed is that in many cases it prevents chatter in the oil boiler-burner unit. When the burner action starts up, primary air flows to the combustion chamber prior to the delivery of oil to the nozzle from the pump. Stainless steel construction is said to make the valve highly resistant to corrosion and oxidation. Soft synthetic inserts are used to prevent leakage and spring loading is employed to insure positive closing or opening in any position. Coils are impregnated to withstand moisture.



LITERATURE AVAILABLE — Bulletin 492.

MADE BY—*Skinner Electric Valve Div., The Skinner Chuck Co., Norwalk, Conn.*

Item 260

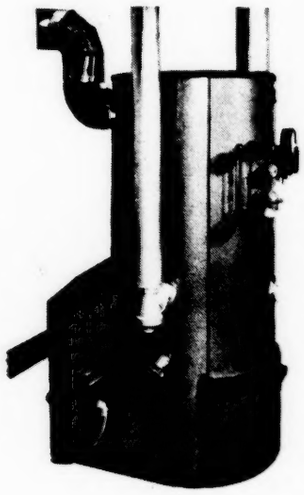
Fire Chief Boiler-Burner

NAME — Fire Chief automatic boiler-burner unit.

PURPOSE—Automatic burning of anthracite coal in a small size stoker unit.

FEATURES—Unit utilizes a new method of feeding and burning anthracite coal across a perforated plate. Burner employs the cross feed principle developed by the Anthracite Institute which holds the basic pattern. Rice or buckwheat size coal is burned. The burner, or mechanical unit, is attached to the boiler and all working parts are completely outside the boiler. No gears are used. A 1/8-hp motor supplies all power requirements. Uniform feed to the entire surface of the perforated plate is brought about by a feed-deflector and a free-floating worm with flights of varying diameters so that an even layer of coal is pushed on to the flat rectangular fire bed. As the coal feeds over the plate it is burned to an ash and falls over the edge, spilling into an ash container. Hot water is automatically supplied from a built-in tankless coil.

SIZES AND CAPACITIES—C-1 develops 80,000 Btu; C-2, a larger unit to develop 130,000 Btu will be in production soon. C-1 unit stands 52 inches high, 23 inches wide, and 32 inches deep.



MADE BY—*Coal-O-Matic Company, Trucksville, Pa.*

Item 261

Metal Jacket for Pipe

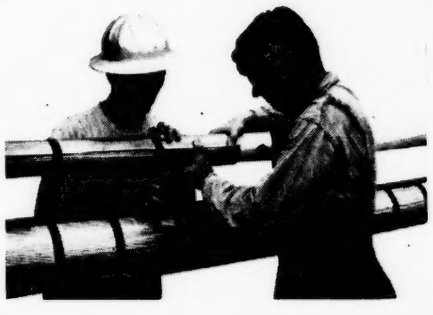
NAME—Childers aluminum weather-proof jacketing.

PURPOSE—A jacketing material of light weight which can be easily applied in the field.

FEATURES—Jacketing material has ribbed 3/16 inch corrugations and sufficient flexibility to be formed around insulated pipe lines. Jacket is held in place by bands of Minnesota Mining's No. 471 plastic film Scotch tape. Using labor at $1.50 an hour, makers claim the cost for applying on insulated lines is 6 cents per sq ft.

MADE BY—*Childers Manufacturing Co., 625 Yale St., Houston 7, Tex.*

Item 262

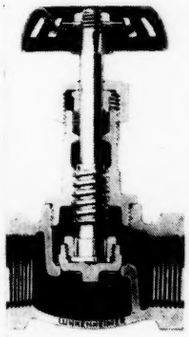


Lunkenheimer Valve

NAME—Lunkenheimer 125 lb S.P. globe valve.

PURPOSE—Flow control.

FEATURES—Body is constructed of bronze. Bonnet is provided with wide flat surface to enable a good wrench grip. Bonnet collar does not extend beyond the body neck, thereby protecting it against damage and leakage. A silicon bronze alloy is used for the stem. The disc is constructed of bronze, is renewable in the larger sizes. In sizes ½ inch and smaller the disc is integral with the stem. Valve has machined repacking seats and deep stuffing-box with sufficient threads to permit a tight joint even when fully packed.



LITERATURE AVAILABLE — Circular 582.

MADE BY—*The Lunkenheimer Co., Cincinnati 14, Ohio.*

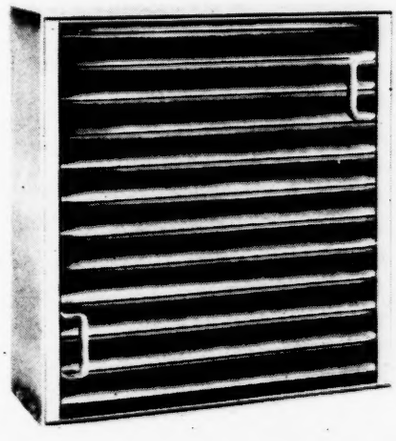
Item 263

Dorex Cell

NAME—Dorex type C air recovery cell.

PURPOSE—Air purification.

FEATURES — The accordion pleat construction of the perforated filter element provides a filter face area of 28 sq ft in a space of less than 3 cu ft. This cell may be installed in multiple, in either flat or V arrangement. For abnormal odor concentrations, the manufacturer recommends installation of two cells in series per 1,000 cfm. Unit is constructed of lightweight metal and is filled with Dorex activated carbon. It is so designed that all air will flow through the large exposed carbon area at uniform air velocity.



SIZES AND CAPACITIES—Face dimensions, 24 x 24 inches; depth, 8 inches; resistance, 0.17 inches water gauge.

LITERATURE AVAILABLE — Bulletin.

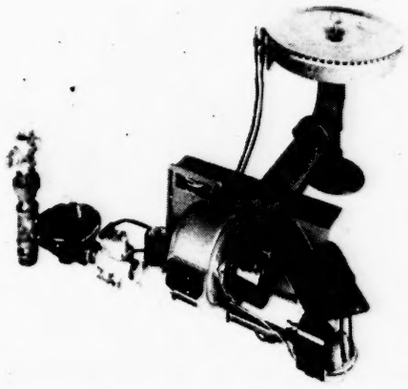
MADE BY—*W. B. Connor Engineering Corp., 112 E. 32nd St., New York 16, N. Y.*

Item 264

Maxwell Burner

NAME—Maxwell-Heatwell gas fuel burner.

PURPOSE — Conversion type gas burner.



FEATURES—Burner head extensions are available to lengthen burner according to boiler depth. Air is supplied by a blower and mixed thoroughly with the incoming gas before it enters the combustion chamber. The forced air aids in drawing in the gas. A mercury pressure switch turns on the combustion blower only when the main gas supply comes on. A Guardwell valve is used for close gas adjustment in order to provide economical operation. The burner head has angling wiping head jets for directing the flame to the desired points. If the pilot light goes out, the main gas supply is shut off. Each jet of flame passes through incandescent ports of firebricks on top of each cast iron burner head. Unit is said to be suitable for operation in high altitudes from 2,000 to 5,200 ft.

SIZES AND CAPACITIES — Domestic gas burners are made in two size heads with rated capacities up to 240,000 Btu per hr.

MADE BY—*Maxwell-Heatwell Co., 1432 S. Logan St., Denver 10, Colo.*

Item 265

Auburn Furnace

NAME — Auburn gas-fired winter air conditioning unit.

PURPOSE—Space heating for the small home.

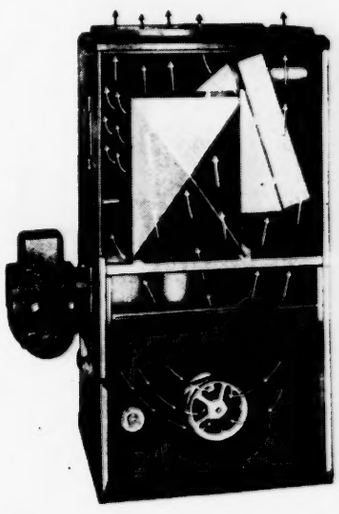
FEATURES—Unit is designed for installation in either utility room or basement space. All parts are readily accessible and the furnace is shipped completely assembled. Blower has a vertical discharge. Long flue travel is said to increase the efficiency of the unit. Combustion chamber is made of 14-gage steel and the radiator of 16-gage steel. Stack diameter is 6 inches. An automatic humidifier is provided. Unit may be supplied with filter on either right or left side.

SIZES AND CAPACITIES—Warm air outlet, 22¼ x 25¾ inches; cold air outlet, 20½ x 25½ inches. Heating capacity, 85,000 Btu; fan capacity, 1,000 cfm; blower wheel size, 9 inches; blower motor, 1/6 hp; casing size, 25¼ x 28½ x 56 inches.

LITERATURE AVAILABLE—Leaflet.

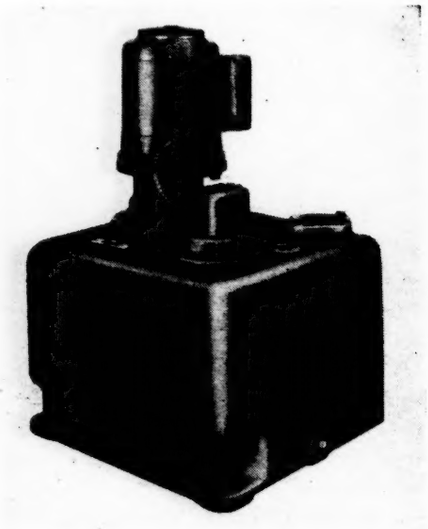
MADE BY—*Auburn Burner Co., Auburn, Ind.*

Item 266



Hydrovac Pump

NAME—Hydrovac Space Miser condensate pump.
PURPOSE — Packaged condensate pump unit designed for heating systems from 500 to 8,000 EDR.



FEATURES—Unit is designed to fit into a basement corner. Inlet for returns is 9½ inches above the floor line. It may be placed in a pit with the return inlet at the floor line. Unit has a gray iron receiver of 10-gal capacity, a bronze basket type strainer removable from the top for cleaning, and a Square D float switch. Bronze impeller is attached directly to the motor shaft. A mechanical shaft seal, made by the John Crane Co., is used to eliminate the possibility of packing gland troubles. Unit is powered by a capacitor type vertical ball bearing totally enclosed ¼ hp motor with built-in overload protection.
SIZES AND CAPACITIES—12 gpm at 20 lb per sq in. discharge.
MADE BY — *American Hydrovac, Inc., 290 Scholes St., Brooklyn 6, N. Y.*

Item 267

Tank Lining

NAME—Carbo-Flex.
PURPOSE—A protective resin to be used for lining wood tanks and for providing a non-corrosive surface.
FEATURES—Material is said to have high resistance to acids, alkalis and solvents at temperatures as high as 375F. Material consists of a liquid and powder which when mixed has a mortar-like consistency and is troweled on the surface to be protected. It can be applied to vertical surfaces in layers of about 1/16 inch without sagging. Once set, material is hard, waterproof, and is said to be impervious to most corrosives and solvents except nitric acid and sulfuric acid over 45% concentration. Material is very hard and relatively brittle. Its compression strength is about 10,000 lb per sq in. One trowel coat of this substance, 1/32 to 1/8 inch thick, is said to be sufficient for the average job.
MADE BY—*Carboline Co., 7603 Forsythe Blvd., St. Louis 5, Mo.*

Item 268

Radiant Heating System

NAME — Scott-Newcomb radiant heating system.
PURPOSE—Radiant heating system employing warm air as the heating medium.
FEATURES — The Scott-Newcomb boiler, which can use either oil or gas fuel, contains a tankless hot water coil that supplies water for domestic use and an aquastat which maintains water temperature at 180F for heating purposes. When heat is required, a water circulating pump forces hot water through the heat exchanger which is located at the bottom of a duct near the basement floor or, where this is not possible, the heat exchanger is located near the basement ceiling. Air, heated by this exchanger, rises through the vertical duct and is distributed in all directions over the entire ceiling area in a space between the joists and a dropped ceiling. This air is returned to the basement through spaces between the vertical studs in the outside walls. As these walls are exposed to outside weather conditions the return air spaces are chilled, thereby causing a rapid drop of the air which, in turn, pulls the heated air through the heat exchanger over the ceiling area. By using the structure as the duct system and radiating surface, makers claim high heating efficiency is obtained. It is desirable to locate the vertical heat shaft as near the center of the building as possible and this shaft should be insulated on all sides. Return air ducts quickly respond to outside weather conditions without the use of outside thermostats. No air blower or filters are used as this would interfere with the balancing of the system. Makers claim the system anticipates outside weather changes without the use of special outside controls.
LITERATURE AVAILABLE—Bulletin.
MADE BY — *Scott-Newcomb, Inc., 1442 S. Boyle Ave., St. Louis, Mo.*

Item 269

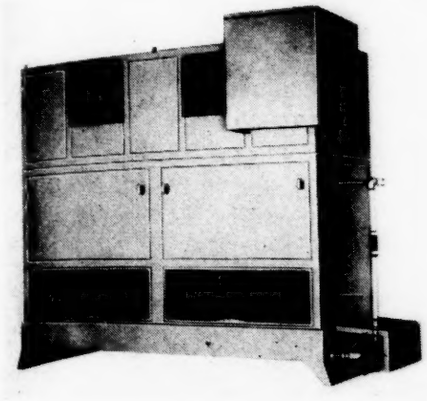
Duo-Therm Heater

NAME—Duo-Therm gas burning space heater.
PURPOSE—Space heating.
FEATURES—Cabinet is designed to resemble period furniture and is available in Chippendale and Hepplewhite designs. Control consists of a single, compact self-contained package unit which includes a gas pressure regulator, pilot filter and flame control dial with a special safety catch to prevent small children from tampering with the pilot. Forced heat circulation can be obtained by adding a Power-Air blower. The Equaflame gas burner has a bias baffle and accurately machined ports. A heavy gage heat chamber is used. A flexible draft diverter permits greater ease in locating the heater in the home.
SIZES AND CAPACITIES—65,000 Btu input.
MADE BY—*Duo-Therm Div., Motor Wheel Corp., Lansing, Mich.*

Item 270

Kennard Evaporative Condenser

NAME—Kennard evaporative condenser.
PURPOSE — For condensing Freon and ammonia refrigerants.

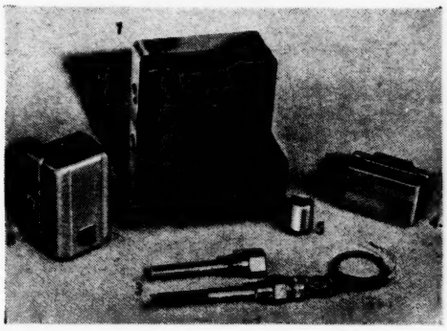


FEATURES — Frame members have been designed to make possible multiple service and access panels in the welded frame assembly. Vibration failures at tube and tube sheet junction, it is said, have been avoided. For ammonia, hot-dipped galvanized steel coil assemblies are used. Condenser has copper spray headers and tube sheets and heavy steel coil side frames, galvanized after fabrication. Hydraulic expansion at 3,000 lb per sq in. is said to insure good thermal and mechanical bond between tube and fin. Brass spray nozzles are installed. Motor and pump are mounted on a channel base. Should it be necessary to have the pump located elsewhere, base can be detached. Smaller size units available in vertical discharge only; larger sizes can be supplied with horizontal discharge.
LITERATURE AVAILABLE — Bulletin EC 491.
SIZES AND CAPACITIES—From 3 to 50 tons. Duplexed to 100 tons.
MADE BY — *Kennard Corporation, 1819 S. Hanley Rd., St. Louis 17, Mo.*

Item 271

Electronic Moduflow

NAME—Electronic Moduflow, package set, Y216-A.
PURPOSE—To provide sensitive comfort control for floor panel systems either employing a gas- or oil-fired heating system.
FEATURES — The package consists of (1) an electronic relay amplifier, (2) outdoor anticipator, (3) immersion thermostat, (4) electronic thermostat, and (5) cycler. The electronic Moduflow, by cycling the circulator, varies the volume of water to the panel in proportion to the demand for heat as measured from room and outdoor conditions. A low-limit aquastat, which is set to maintain the desired water temperature for domestic use, controls burner operation. Without domestic hot water, the Moduflow cycles the circulator and either a T418B outdoor reset control or a low-limit aquastat may be used to control burner operations. The package set illustrated is required for each zone where zone operation is used in order to cycle the circulator for the respective zone. For forced warm air applications, a different package set is available.

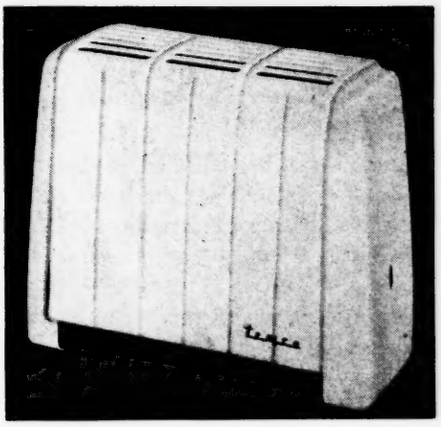


LITERATURE AVAILABLE—Folder.
MADE BY—*Minneapolis-Honeywell Regulator Co., Minneapolis 8, Minn.*

Item 272

Temco Heater

NAME—Temco vented heater, model 122-1W.

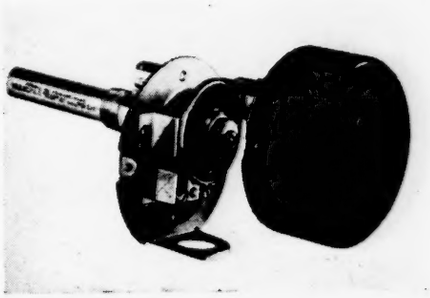


PURPOSE—Space heating.
FEATURES—Unit has a die formed heat chamber seam welded for maximum efficiency. Heater is AGA approved for use with natural, manufactured or liquefied petroleum gases. The natural and manufactured gas model is provided with a Blue Flame pilot and manual valve, while with the liquefied petroleum gas model a Baso safety pilot is supplied.
SIZES AND CAPACITIES—Input rating is 12,000 Btu. Unit is 31 inches high, 17¾ inches deep, and 30 inches wide.
MADE BY—*Tennessee Enamel Mfg. Co., Nashville 9, Tenn.*

Item 273

Fenwal Control Switch

NAME—Fenwal Thermoswitch.
PURPOSE—Immersion-type temperature control for hot water heating systems.
FEATURES—The drawn brass shell of the thermostat is the temperature-sensitive element and it remains in direct contact with the water in the heater. As the temperature rises, the shell expands in length and it exerts tension on the ends of the two curved struts, thus pulling the insulated silver contact points apart. An adjusting screw

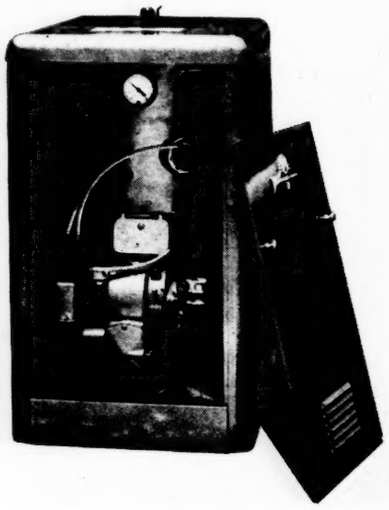


is provided so that one-half turn of the adjusting knob will increase or decrease the setting by about 60F. At the factory the switch is calibrated at 165F at the mid point of the dial.
SIZES AND CAPACITIES — Unit is rated at 10 amps at 110 volts a-c, 50 amps at 220 volts a-c. Temperature setting range is from —50F to 400F.
MADE BY — *Fenwal Incorporated, Ashland, Mass.*

Item 274

Fairbanks-Morse Boiler

NAME — Fairbanks-Morse package unit oil- or gas-fired steam boiler.
PURPOSE—Line of packaged unit steam boilers designed for oil or gas firing.

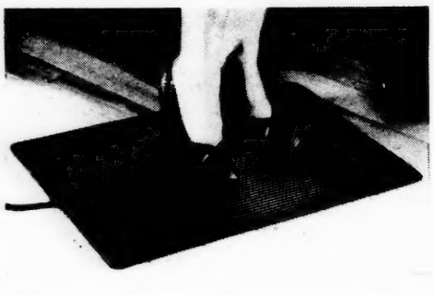


FEATURES—Units are shipped all ready to be plugged in for immediate service upon arrival. The burner and all controls are already mounted and wired ready for operation. Unit is 38 inches high and 37 inches long. Access to burner and operating controls can be obtained by removing the front lift-out door. Burners are provided with corrugated flues which are said to result in better heat transfer.
SIZES AND CAPACITIES—320, 400, 550, 700 and 900 sq ft of steam.
MADE BY—*Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5.*

Item 275

Thermo-Mat

NAME—Thermo-Mat.
PURPOSE—Flexible rubber heating mat.
FEATURES—Mat, which is said to be resistant to oils and acids, has ribs on both sides to increase its wear and to facilitate cleaning. Mat is 5/32 inch thick and has no raised obstructions. A pre-set thermostat is cast inside the unit to maintain a constant heating temperature. Heating elements are cast in the mat.

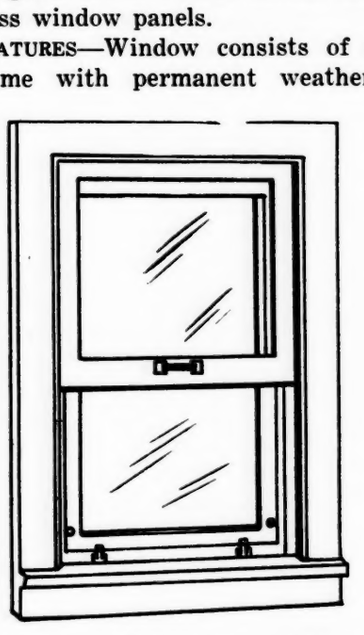


SIZES AND CAPACITIES—14 inches wide by 22 inches long; operates on 120 volts, 50 or 60 cycles a-c current and uses 240 watts when operating.
MADE BY—*Air Appliance Co., 5927 Sunset, Hollywood 28, Calif.*

Item 276

Therm-o-matic Windows

NAME — Williams Therm-o-matic windows.
PURPOSE — Weatherstrip windows designed for use with screen and glass window panels.
FEATURES—Window consists of a frame with permanent weather-



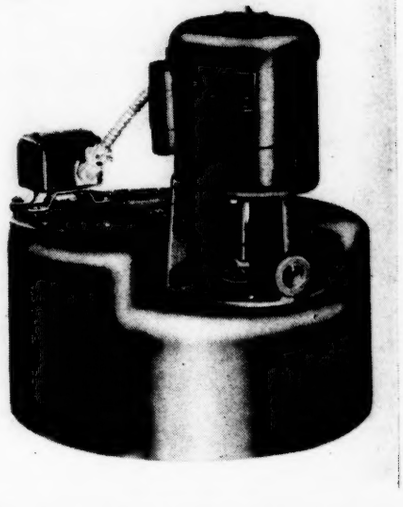
stripping which is available in standard window sizes and in special sizes on order. The entire window opening is closed with a wind-tight seal. In summer time screen inserts are fitted into the frame and in winter time the screens are replaceable with glass windows, all from the inside. The all-metal adjustable closure frame provides permanent weatherstripping for the entire frame opening. All wood parts are treated to resist moisture, warping, swelling and shrinking. The metal closure frame and all hardware are rust-proofed by zinc coating and bonderizing. The window is held tightly by spring tension to prevent rattling.
LITERATURE AVAILABLE—Folder.
MADE BY—*Eureka Williams Corp., Bloomington, Ill.*

Item 277

Skidmore Pump

NAME—Skidmore vertical condensation pump and receiver, type CV.
PURPOSE—For returning condensate to the boiler and to other points from all types of low pressure steam heating systems or process equipment.
FEATURES—The integral pump casing and motor stand is of cast iron, bolted to the top of the receiver. Pump is bronze fitted throughout, with an enclosed type centrifugal impeller. Pump shaft is stainless steel ground and polished. Self-lubricating bronze bearing is installed above the impeller. The 1/3 hp motor is of the capacitor type operating at 115 to 230 volts, single phase, 60 cycles at 3,500 rpm. Motor has thermal overload protection. An automatic float switch is actuated by a heavy copper seamless float within the receiver. The receiver is made of cast iron with low inlet connections suitable for floor mounting or for use in a shallow pit. It has a ¾-inch overflow connection.
SIZES AND CAPACITIES—Three sizes of frames with capacities from 500 to 10,000 sq ft E.D.R., and pressures of 10-20 lb.
MADE BY—*Skidmore Corporation, St. Joseph, Mo.*

Item 278



Pendant Light Fixture

NAME — Kno-Draft air diffuser with adaptation for pendant light fixture.

PURPOSE—Combined air diffuser and lighting fixture to permit both to be installed at same point in ceiling.

FEATURES—Light fixture adaptation is made available so that the air diffuser, with or without air volume damper, can be used in connection with pendant type light fixtures. Air diffusers which are adapted for these fixtures retain all of their functional features such as adjustability for angle of air discharge and the optional air volume control.

LITERATURE AVAILABLE — Bulletin.

MADE BY—*W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y.*

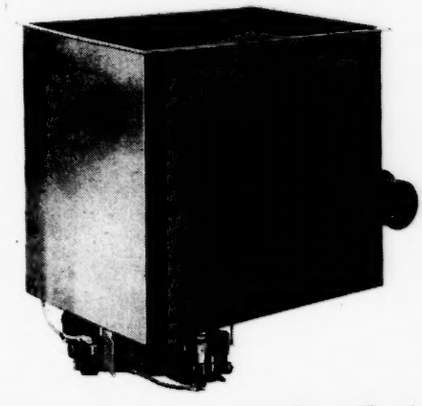
Item 279

Pro-Therm Floor Furnace

NAME — Pro-Therm oil-fired floor furnace.

PURPOSE—To provide space heating and air circulation in small structures.

FEATURES—Unit is built in three models: (1) mechanical draft blower to supply combustion air to the burner with a thermostat for controlling the fire; (2) natural draft burner with manual control; (3) natural draft burner with electric thermostat. The mechanical draft unit is factory wired ready for installation by connecting the 115-volt circuit into the outlet box on the furnace casing. Heavy gauge aluminized steel is used in the combustion drum and heat exchanger. A removable door in the furnace bottom permits cleaning the bottom of the furnace casing without disturbing the unit. Combustion section may be lifted from the casing by disconnecting the drum from the radiator, leaving the stack connection intact.



SIZES AND CAPACITIES—Maximum output for mechanical draft unit, 58,500 Btu per hr; natural draft units, 51,300 Btu per hr.

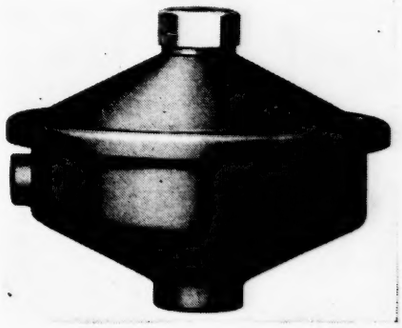
MADE BY—*Thermo-Products, Inc., N. Judson, Ind.*

Item 280

Sparkler Oil Filter

NAME—Sparkler fuel oil filter, model OB.

PURPOSE—To remove fine particles of dirt and foreign material from fuel oil.



FEATURES — A positive mechanical seal is said to prevent oil from bypassing the filter element which is made of rayon and nylon composition. Filter element, which is replaceable, is said to provide a season's service for the average home burner. Inlet and outlet have 3/8-inch pipe connections.

MADE BY — *Sparkler Manufacturing Co., Mundelein, Ill.*

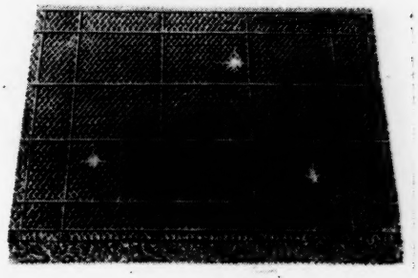
Item 281

Alumaloy Air Filters

NAME—R-P Alumaloy air filters.

PURPOSE—Air cleaning.

FEATURES—Filter media is made of multiple layers of lightweight, corrosion-resistant expanded Alumaloy sheets that are staggered to provide a baffle pattern. This creates a turbulence in the air stream so that foreign matter is easily extracted as the air flows through. The baffle is coarser on the intake side to reduce surface clogging and to permit maximum air flow. The filters are cleanable and are recharged with a special R-P filter coat. Filters are available in 1- and 2-inch thicknesses in all standard sizes, and special sizes to 25 x 30 inches.



MADE BY — *Research Products Corp., Dept V, Madison 10, Wis.*

Item 282

Lincoln Arc Welder

NAME—Lincwelder 60.

PURPOSE—Small arc welder operating off a 110-volt circuit for welding light gauge metals.

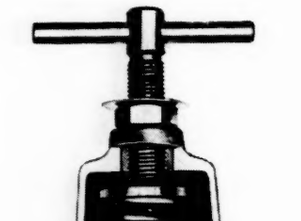
FEATURES — Unit, which weighs about 50 lb, is fused for 30 amperes. It provides a means for combining welding, soldering and brazing sheet metal. It is made with electrical steel mica insulation and glass covered copper windings. Unit comes with 6-ft insulated cord, protective welding head shield and lens, electrode holder, 9-ft cable, ground cable, and a supply of electrode and brazing rods.

MADE BY—*The Lincoln Electric Co., Cleveland 1, Ohio.*

Item 283

Norgren Pressure Regulator

NAME — Norgren relieving type pressure regulator, type 2AX.
PURPOSE—For use with line pressures up to 400 lb per sq in. and working pressures up to 250 lb per sq in. on lines carrying air or non-corrosive gases and fluids such as oil or cold water.

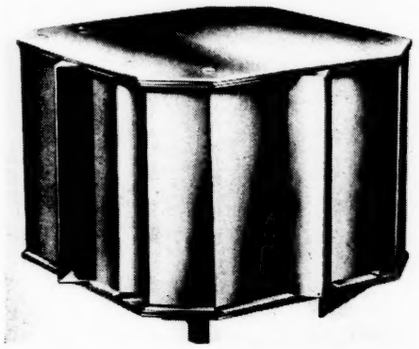


FEATURES—The lower spring rest of the unit which contains the valve opening, pivots on a ball-end valve pin. The relief valve permits downward adjustment of pressure without bleeding the line and this, it is said, is an extra safeguard against damage due to the pressure surges. Lower spring rest automatically adjusts itself to any eccentricity. Unit can be dis-assembled without removing the regulator from the line by the use of the conventional simple tools.
SIZES AND CAPACITIES—For ¼- to 1-inch pipe.
MADE BY—*C. A. Norgren Co., 222 Santa Fe Drive, Denver, Colo.*

Item 284

Agitair Ventilator

NAME — Agitair exhauster, type CNO.
PURPOSE—Ventilator for vent flues, chimney tops, and roof ventilation.
FEATURES—Constructed of heavy gauge steel with a corrosion-resistant finish, unit is said to prevent down-draft and not to restrict the flow of air or gases when there is no breeze. Makers claim it will not interfere with natural draft due to temperature difference. Smaller sizes of unit, 5- and 8-inch sizes, are supplied welded and completely assembled, while the large sizes are supplied KD to be assembled on the job.
SIZES AND CAPACITIES — Available in head sizes from 5 to 48 inches.
MADE BY—*Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.*



Item 285

Frigidaire Air Conditioner

NAME — Frigidaire self-contained store air conditioner.
PURPOSE—Packaged air conditioning unit for use in stores, restaurants and business houses.
FEATURES—Unit consists of three sections—compressor, cooling unit, and air distribution compartments. A metal filter, 1-inch thick, cleans the air before it passes into the Multipath-type cooling unit of 4-row construction. The hood contains 10 outlet grilles equipped with air deflector blades. These discharge the conditioned air from the removable hood at the top of the cabinet. Blower discharge is created by a 12-inch fan powered by a ¾ hp motor. Both fan and motor are cushioned on rubber to reduce sound and vibration. A removable panel at the rear is provided for introducing fresh outside air for ventilation purposes. A concealed control panel contains the starting switch and temperature regulator. A heating coil can be installed for winter time operation. Refrigerant is Freon-12. Flexible connections on refrigerant and water lines are placed to reduce vibration.

SIZES AND CAPACITIES—3- and 5-ton units. The 5-ton unit is provided with a two-cylinder compressor mounted on twin water-cooled condensers connected in parallel and powered by a 5 hp motor. A single condensing unit is used with the 3-ton model.
LITERATURE AVAILABLE—Folder.
MADE BY — *Frigidaire Division, General Motors Corp., Dayton 1, Ohio.*

Item 286

JULY, 1949

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268
269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284
285	286						

Print your name and address, detach and mail to Editor, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

Name.....

Title (Must be shown).....

Firm (Must be shown).....
(For prompt service, title and firm name must be shown above.)

Business Address.....

City.....**Zone**....**State**..... 7/49

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

THERMODYNAMIC CHARTS FOR COMBUSTION PROCESSES

A compilation of charts, tables and texts is embodied in this two-volume work by H. C. Hottel, Professor of Mechanical Engineering; G. C. Williams, Associate Professor of Chemical Engineering; C. N. Satterfield, Assistant Professor of Chemical Engineering, all at Massachusetts Institute of Technology, Cambridge, Mass.

The text is presented in Part I and includes chapters on the modified-air chart, the burned-mixture charts, and generalized thermodynamic charts covering the chemical system of carbon-hydrogen-oxygen-nitrogen. Included is an appendix covering basic thermodynamic data.

Part II, separately bound, contains tables covering the equilibrium gas compositions for various combinations of ratios of carbon, hydrogen, nitrogen and oxygen. It contains seven large folded charts such as the modified-air chart and burned-mixture charts.

Much of the information was compiled as the result of work done at M. I. T. for the National Advisory Committee for Aeronautics, Bureau of Ordnance, United States Navy, and work supported financially by the Standard Oil Development Co.

Thermodynamic Charts for Combustion Processes, by H. C. Hottel, G. C. Williams and C. N. Satterfield. Spiral binding, heavy paper covers, 8¼ x 11 inches. Part I, 75 pages, $2.60. Part II, large folded charts and 23 pages of text, $2.40. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y.

ODORS – PHYSIOLOGY AND CONTROL

A comprehensive analysis of odor perception, measurement, classification and regulation is provided by Carey P. McCord, The Industrial Health Conservancy Laboratories, Detroit, and William N. Witheridge, Ventilation Consultant, General Motors Corp., in their new book.

Included is a good perspective of olfactory, physiology and anatomy, the relationship of odors to health, and the legal aspects of odor control. A number of practical methods are described for eliminating odors from factories, public buildings and homes. The authors start with the common ground of odor physiology and emphasis is then directed to the significance and control of offensive odors.

While odors is not a new subject, and in some fields, considerable attention and study have been devoted to it, this is the first time, it is believed, that a comprehensive technical book has appeared in this country on this topic. The authors have planned the book to make available, in objective fashion, personal and accumulated experience related to odors in general but chiefly to the offensive ones—the import of control and its relation to the community. Included is a bibliography of 124 pages covering books, articles and printed material on odors and related subjects.

The material is divided into 23 chapters. Some of the subjects covered include anatomy and physiology of the olfactory system, odor classification, odor detection and measurement, influence of odors on health and comfort, household odors, odors of waters and foods, industrial odors, the offensive trades, air conditioning and odors, chemical and physical destruction of odors, odor cancellation and counteraction, the sorption of odors, odor repellants and odor attractors, the making of an odor survey, and the legal aspects of odor nuisances.

Odors—Physiology and Control, by C. P. McCord and W. N. Witheridge. Cloth bound, 6 x 9 inches, 405 pages. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. Price, $6.50.

ASHVE GUIDE

The 1949 edition of the Heating, Ventilating and Air Conditioning Guide has just been published by the American Society of Heating and Ventilating Engineers. Material in the book is grouped in 52 chapters and a catalog section to aid in finding the desired text. The chapters in turn are arranged in sections under the following headings: principles, human reaction to atmospheric environment, heating and cooling loads, combustion and consumption of fuels, heating systems and equipment, air conditioning, special applications, and installation and testing codes.

Some of the chapters of the previous edition have been revised and expanded.

This edition was under the supervision of R. C. Cross, Chairman, ASHVE Guide Publication Committee, assisted in its preparation by his committee of ten members.

Heating, Ventilating and Air Conditioning Guide. Cloth bound, 6 x 9 inches, 1,384 pages. Published by the American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York 10, N. Y. Price, $7.50.

• • •

ONE-PIPE FORCED RECIRCULATION HOT WATER HEATING SYSTEMS—Guide No. 100 issued by The Institute of Boiler and Radiator Manufacturers contains details for calculating and designing one-pipe forced circulation hot water heating systems which utilize mains from ¾- to 1½-inch. It also includes data applicable to use of either iron pipe or copper tube pipe for mains, circuits, branches and risers. This Guide, which replaces Guide No. 1, contains 24 pages and a number of illustrations and tables. The Institute of Boiler and Radiator Manufacturers, 60 E. 42nd Street, New York 17, N. Y. Price, 50 cents.

NEWS OF THE MONTH

MINERAL PROBLEMS

include declining reserves and wasteful mining, mines director says.

With only 7% of the world's population, the United States uses 70% of all the oil produced on the globe and 50% of all the minerals, according to James Boyd, director of the U. S. Bureau of Mines. In addition, the United States does 40% of the world's work through the use of energy obtained largely from mineral fuels, he said.

In an address before the Northeast Chapter of the Pennsylvania Society of Professional Engineers at Scranton, Pa., on May 14, Dr. Boyd pointed out a number of weak spots in the American minerals picture and outlined what is being done by Government and industry to restore full economic security in this field.

• **GROWTH.**—Despite our own increasing mineral output, our self-sufficiency in minerals is declining, Dr. Boyd stated. As an example of the rapid rate of increasing mineral production in this country, he noted that we are today producing three times the *physical volume* of mineral commodities that we produced in 1910, the year the Bureau of Mines was established.

To keep pace with increasing consumption, America must extend and develop domestic reserves of ore and in many instances replace materials that eventually will become insufficient for our needs, Dr. Boyd said.

Fortunately, our native inventive genius has in the past provided new materials to supplement the old, the Director said. There is absolutely *no* reason to believe that we will not continue to progress as our research laboratories develop new technology. One objective of the Bureau of Mines is to anticipate demands in this field so that new materials will be developed and ready when needed to replace those less easily obtained.

• **FUELS.**—Devoting a large portion of his remarks to the subject of mineral fuels—coal, petroleum, oil shale, gas, synthetic products, and others—Dr. Boyd concluded that it is obvious that the country eventually must anticipate the use of coal as the primary source of our mineral fuels. Although the United States has much larger coal reserves than either petroleum or natural gas, at the present time an increasing proportion of energy is coming from oil and gas, he noted.

Through research in the production of synthetic liquid fuels from coal and oil shale, the Bureau of Mines hopes to help improve the situation in this respect, Dr. Boyd said. He described how the Bureau, in cooperation with industry, is also experimenting with the underground gasification of coal to obtain gases for generating electric power and raw materials for synthetic liquid fuels. If successful, this experiment may prove "a boon" to conservation and to the industry, he added.

• **WASTE.**—Wasteful mining—leaving a considerable percentage of the coal underground—was described by Dr. Boyd as one of the most pressing problems to be solved by the mining industry. In Europe, he said, 100% removal of coal is a forced objective. The Bureau of Mines is attacking this problem by studying different mining methods and making recommendations to industry.

Aside from research in synthetic fuels made from coal, an enormous amount of work is going on in industry and in Bureau of Mines laboratories to encourage greater utilization of coal in its natural form, Director Boyd pointed out. For instance, the Bureau is investigating the composition and nature of various types of coal to determine the most efficient uses in burning under boilers for producing energy, in raising steam for generating electricity, in utilizing the fuel directly in space heating, and in other industrial uses.

• **METALS.**—Illustrative of the problem of declining self-sufficiency in certain metallic minerals, Dr. Boyd cited the critical nonferrous metals, copper, lead and zinc. Before the first world war, America's surplus production was exported, he said, but now it has become necessary to increase the *imports* of these critical materials repeatedly to meet our industrial demands. Chromite is another important mineral wherein we are depending upon foreign supply to meet our industrial requirements. We must intensify exploration of these metals in the United States, he said, and develop the maximum reserves possible.

In addition to discovery, metals reserves are being extended by advances in the technology of extracting lower-grade ores at a profit, and by improving beneficiation and metallurgical processes that permit the use of these lower-grade materials, Director Boyd added. He described how the Bureau of Mines is pursuing a broad research program in mining and metallurgy to assist the industry in solving many of the knotty problems.

A dramatic recent development is that of the metal titanium, the future of which is difficult to predict. Here is a material that is abundant in the earth's crust, has extraordinary structural possibilities, and may well have an important bearing on our future use of metals. Perhaps it is in the same stage of development today that aluminum was 75 years ago. The Bureau of Mines pioneered successfully in the research and pilot-plant work on titanium, and just this last year, industry began to take up production of the metal itself.

• • •

• Underground gasification tests at Gorgas, Alabama, were resumed in March as a follow-up to similar experiments completed last year. Present objectives are to determine the limits of coal quality, inlet and outlet design, operating characteristics, gas analysis, etc.

EFFICIENT SERVICE COMES FIRST in Cincinnati's Terrace Plaza Hotel

135,000 pounds of Revere Copper Water Tube insure efficient service from the Terrace Plaza's hot and cold water lines and air conditioning system.

Cincinnati's new Terrace Plaza Hotel was "conceived and constructed for the sole purpose of rendering guests the most modern conveniences known to science and the ingenuity of man." Every detail of construction was selected for its ability to provide the finest service.

Consequently, Revere is particularly proud that 135,000 pounds of Revere Copper Water Tube were used in the hot and cold water lines and air conditioning system of this carefully-planned hotel.

Revere hard temper tube is furnished in straight lengths of 12 feet and 20 feet. Revere easy-bending soft temper tube is available in straight lengths or long coils. All Revere Copper Water Tube is stamped at regular intervals with the Revere name and the type. These marks are more than identification—they are your assurance of full wall thickness and the close dimensional tolerances so essential for tight soldered joints.

It will also pay you to install such other long-lived Revere materials as Red-Brass Pipe; Sheet Copper and Herculoy for tanks, ducts, pans and trays; Dryseal Copper Refrigeration Tube (dehydrated and sealed); Copper oil burner, heat control and capillary tubes.

Revere materials are handled by Revere Distributors in all parts of the country. The Revere Technical Advisory Service is always ready to serve you. Call your Revere Distributor.

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Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

TERRACE PLAZA HOTEL
Cincinnati, Ohio

Skidmore, Owings & Merrill—Architects; Jaros, Baum & Bolles—Engineers; Frank Messer & Sons, Inc.—General Contractor; E. J. Nolan Corp.—Plumbing and Heating Contractors; Carrier Corporation—Air Conditioning and Refrigeration; Mutual Manufacturing & Supply Co.—Revere Distributor.

ASRE SPRING MEETING

combined with cruise on St. Lawrence and Saguenay Rivers, June 5–9.

Departing from the conventional pattern for its annual spring meeting, the American Society of Refrigerating Engineers combined the business of technical sessions on board the S. S. Richelieu with the pleasures of a cruise on the St. Lawrence and Saguenay rivers. Arrangements included an inspection of the Arvida plant of the Aluminum Company of Canada and the Shipshaw hydroelectric power plant, and for sightseeing at Quebec and other points. In all, 350 members and guests attended the meeting and cruise, June 5-9, which started from Montreal, Sunday noon.

The first afternoon was devoted to meetings of various committees.

President B. H. Jennings presided at the first technical session held on Monday morning at which four technical papers were presented.

• **PAPERS.**—Action of Desiccants in the Removal of Water from Refrigerating Systems, by B. J. Sterk, Socony-Vacuum Laboratories, Brooklyn, N. Y., was presented by J. F. Butterworth of the company's New York office. The paper discussed some of the standard desiccants for the removal of moisture and the results obtained during laboratory studies.

Determination of Water and non-condensable Gas Content of Freon-12 Gas by a Dew Point Method was described by Dr. H. M. Elsey, Westinghouse Electric Corporation Research Laboratories, East Pittsburgh, Pa. He showed that a simple dew point apparatus may be used to determine the water vapor and non-condensable gas contents of Freon-12 and that the results of these determinations may be used to estimate the condition of the refrigerating systems from which the samples are taken, provided the samples are taken with reasonable care.

A comprehensive paper on Moisture in Walls of Cold Storage Rooms was presented by Dr. Carl Munters, Stocksund, Sweden. He said that one of the most effective and practical ways of providing moisture protection is to use a type of insulating material that permits the circulation of dry air in the insulating space adjacent to the inner lining. Other means for achieving protection were discussed.

• **ABSTRACTS.**—At the second technical session, held Monday evening, Dr. D. K. Tressler, chairman, ASRE Publications Committee, spoke on *Refrigeration Abstracts* in which he defended the wisdom of the society continuing its publication as an important technical and scientific service.

Clifford Holske, former ASRE president, presented an opposing point of view and called attention to the large monetary expenditure that would be necessary for the limited benefits obtained. Several members discussed Dr. Tressler's paper.

Air Cycle Refrigeration and its Applications were described by Paul C. Scofield, AiResearch Manufacturing Co., Los Angles, Calif. High rotative speeds and power requirements that are required are more than offset by the light weight of the unit and the small amount of space that is required. Air as a refrigerant has an advantage where the application is subjected to vibratory loads that are apt to cause leaks in a conduit. The cycle can be more logically applied to aircraft than any other type of refrigeration. Several types of systems using this cycle were described.

J. L. Orr, Head, Low Temperature Laboratory of the National Research Council, Ottawa, and D. G. Henshaw were authors of a paper on A New Canadian Laboratory for Arctic Testing. He described some of the work carried out at this laboratory.

• **TRIP.**—Tuesday morning was occupied by an inspection trip to the extensive Arvida plant of the Aluminum Company of Canada and to the Shipshaw Power Development completed primarily for supplying electric power to the world's largest aluminum smelter. The watershed supplying the development has an area of 30,000 square miles.

• **REFRIGERATION.**—At the third technical session, Dr. A. A. Berestneff, Carrier Corporation, Syracuse, N. Y., described A New Development in Absorption Refrigeration. He explained the absorption cycle and the features of the machine that was developed as the result of seven years of laboratory tests and field operation. The machine (H & V, June, 1949, page 96) delivers cold water at temperatures as low as 36F and is capable of maintaining the water at nearly constant temperatures. Steam consumption, which is practically independent of steam pressure, is within 19 lb per ton per hr.

In a paper prepared by Douglas Chalmers of the Gates Rubber Co., on Cold Rubber—its Preparation, Properties and Application, Denver, Colo., and read by A. J. Hess, Los Angeles, Calif., the details of this synthetic rubber process were described. Cold rubber is prepared at a chemical reaction temperature of 41F instead of the usual 122F. The material is made by a chemical reaction known as polymerization. Steps in this polymerization process and the manufacture of cold rubber were covered. The low temperature reaction makes the cold rubber molecules more orderly. In the manufacture, about 23,000 lb of material are used per batch with a total minimum steady refrigeration load of 81 tons per day and a peak load as high as 241 tons per day.

M. M. Bolstad, professor of mechanical engineering, University of Missouri, and R. C. Jordan, professor of mechanical engineering, University of Minnesota, presented a paper on Theory and Use of Capillary Tube Expansion Device, Non-Adiabatic Flow. It presented the experimental results of a test program on capillary tube expansion devices using heat exchangers. The authors also outlined a design procedure for using the data as outlined. Flow rates were given for 15 different bore-length combinations at three different inlet pressures.

Horace E. Staph, Bureau of Engineering Research, University of Texas, read a paper on Specific Heat of Foodstuffs.

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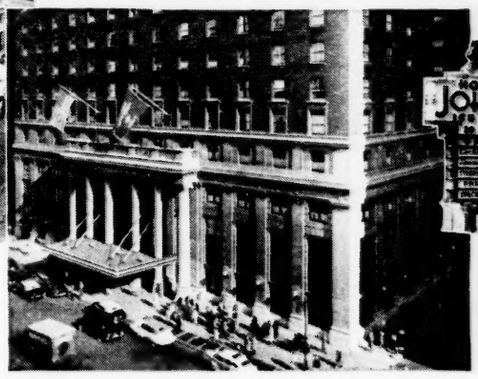
From coast to coast Chrysler Airtemp is improving summer business—increasing customer comfort—increasing personnel efficiency.

Eleven Years Dependable Performance in Jewel Theatre, Mt. Clemens, Mich.

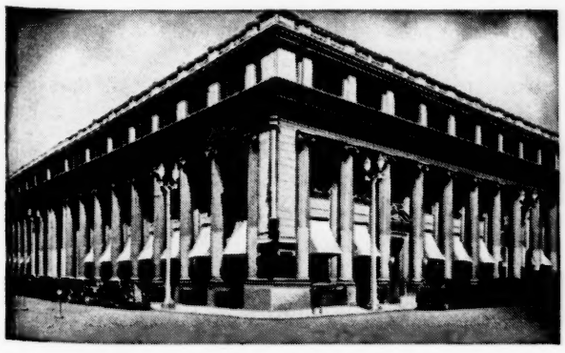
Helps Write Success Story at Hughes & Hatcher —a Leading Men's Store in Detroit.

Ten Years Dependable Cooling for Omaha Union Pacific Offices.

In Action Twelve Years in the Hotel Statler, New York.



Nine Years of Summer Comfort for Howard Johnson Restaurants.



Ten Years Taming the St. Louis Sun for Mercantile Bank.

Chrysler Airtemp units cut installation and maintenance costs—they are designed to fit your needs. Discuss your cooling problem with your local Airtemp dealer or write to us direct.

Chrysler Airtemp

AIRTEMP DIVISION OF CHRYSLER CORPORATION
Dayton 1, Ohio

The final technical session was devoted to domestic refrigerator engineering. A large number participated in the discussion.

• **SOCIETY BUSINESS.**—A proposed amendment was approved for later ballot by the entire membership, that would eliminate existing objectionable differences in grades of junior and student memberships.

The annual meeting of the society is to be held at the Edgewater Beach Hotel, Chicago, December 5-8, and the spring meeting is tentatively scheduled for Kansas City, Mo., June 6-9.

The boat returned to Montreal on Thursday morning with hundreds of passengers enthused over the merits of a combined business and pleasure cruise for an engineering convention.

NEWS BRIEFS

• Federal loans to industry for construction of commercial plants producing oil and gasoline from coal and oil shale were strongly recommended by Secretary of the Interior J. A. Krug in his 1948 annual report to Congress. Two bills (H. R. 566 and S. 6) to accomplish this purpose have been introduced in the new Congress.

• A Standards Committee of the American Society of Refrigerating Engineers has been established to set up rating and testing standards for desiccants. W. O. Walker of the Ansul Chemical Company is chairman of the committee and requests suggestions from engineers in the industry who are familiar with drying problems.

• Directors of the National Association of Refrigeration Contractors at their regular quarterly meeting March 31 approved a joint resolution between the Labor Relations Committee of NARC and officials of the United Association. The resolution acknowledges on the part of the contractors that the United Association has sole jurisdiction in the refrigeration and air conditioning industry; and the United Association acknowledges that NARC is the national association representing the refrigeration and air conditioning industry, that its local chapters are the bonafide bargaining agents for labor agreements. The two organizations agreed to mutually undertake an apprentice training program for the refrigeration industry.

• The first project to be undertaken by the Building Research Advisory Board, National Research Council, will be a survey to determine why modular coordination of building materials, equipment, and design has not yet found wider practical use, despite its extensive technical development. Arthur D. Little, Inc., Cambridge, Mass., research and engineering organization, has been engaged by the Board to obtain data on this subject.

• The extent of housing research in Sweden during the past ten years is described in two reports now available from the Office of Technical Services of the Department of Commerce.

• Private investors and the City Housing Authority have completed or started 63,221 permanent dwelling units in multi-family apartment developments costing approximately $500 million in the five boroughs of New York City since January, 1946. An analysis by the Building Trades Employers' Association of new post-war building revealed that projects occupied or under construction will house approximately 228,000 persons.

• The Engineering Experiment Station at Montana State College has established a fellowship grant of $1,000 for research in designing, testing and analyzing radiant panel heating residence installations operating under Montana conditions. The recipient of the fellowship may enroll for full time study in the graduate school taking radiant heating as his major subject. Appointment will be made September 15, 1949. A Bachelor of Science Degree is the prerequisite.

• The International Joint Committee on Psychrometric Data met May 12 under the chairmanship of Dr. Baldwin M. Woods and accepted the final report of its working subcommittee. This report recommends a formulation of the thermodynamic properties of moist air within the accuracy of existing data. The formulation includes skeleton tables with recommended tolerances and recommended values of physical constants; dry air is defined in terms of a fixed molfraction composition. The Committee favors redefinition of relative humidity as the ratio of the given humidity mixing ratio to the humidity mixing ratio at saturation with respect to liquid at the given temperature and pressure.

• Total revenues from sales of gas by utilities in the first quarter of 1949 were $535 million, an increase of 6.9% over the comparable period in 1948. Revenues from industrial sales rose 15%, while residential and commercial revenues were 4% and 11%, respectively, during the period.

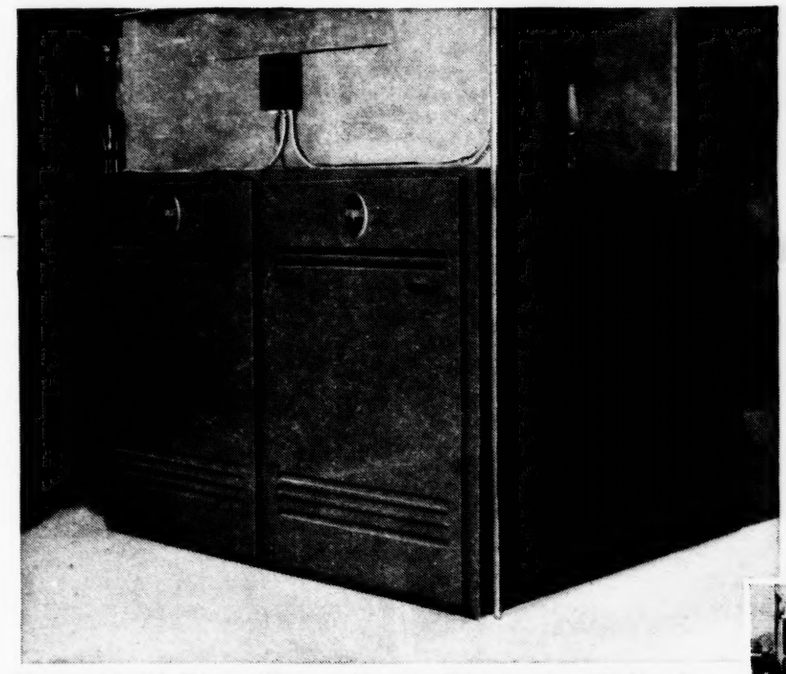
• A helicopter was used in Buffalo during May to obtain an overall picture of the air pollution hovering over the city. A special city ordinance permitted the helicopter to travel at less than the 1,000 ft altitude prescribed for airplanes. H. S. Lammers, chairman of the Coal Producers Committee for Smoke Abatement from Cincinnati, visited Buffalo and made use of the helicopter in the smoke pollution survey.

• Measurements made by the National Bureau of Standards in 1919 on the thermal conductivity of 85% magnesia insulation having a density of 19.3 lb per cu ft, yielded a k value of 0.51 at a mean temperature of 86F. Tests made earlier this year by the Bureau on 85% magnesia of 13.2 lb per cu ft indicate a k value of 0.39 at 130F mean temperature. Values are in Btu per (hr) (sq ft) (F).

• New construction put in place in May was valued at $1.6 billion, a value equal to that of May a year ago.

"BRYANT Winter Air Conditioning provides *Customer Comfort* AT LOW COST"

says A. Wilner, Owner-Operator, Western Auto Associate Store, Somerville, N. J.



Bryant Model BA-88 Winter Air Conditioning installation in Western Auto Associate Store delivers warm air to the store through overhead supply outlets. Return air is removed from the store at several points along the floor line. Heating contractors: Elling Bros., Somerville, N. J.

"Bryant Winter Air Conditioning does a very highly satisfactory job in our store... warms, filters, humidifies and circulates the air to provide comfort for customers and employees alike. We are happy to recommend Bryant Automatic Heating."

You can get a *full* share of the warm-air heating business in your area with the Bryant Model BA-88 Gas-Fired Winter Air Conditioner. The BA-88 has a place in the forced warm-air systems of all types of homes and helps create ideal indoor weather in offices, stores and other commercial applications.

These Bryant-engineered features set the BA-88 apart from ordinary warm-air equipment: All cast iron tubular heat exchanger for years and years of superior service and high operating efficiency; rugged cast iron burners with raised, *precision-drilled* ports (specifically drilled for the type of gas to be burned, whether it be natural, manufactured, LP or mixed gas); and the famous Bryant Diaphragm Valve and Automatic Pilot.

The Bryant Model BA-88 Winter Air Conditioner is fully enclosed in its sturdy steel jacket, requires a minimum of floor space for equipment of its type. It is made in seven standard sizes, with inputs from 60,000 to 250,000 Btu per hour.

Let the pup be furnace man ... and water boy, too!

bryant

AUTOMATIC HEATING

BRYANT HEATER DIVISION

Affiliated Gas Equipment, Inc.

Cleveland, Ohio • Tyler, Texas

THE MOST COMPLETE LINE OF GAS HEATING EQUIPMENT IN THE NATION

DEGREE-DAYS FOR MAY, 1949

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	May			Cumulative, Sept. 1 to May 31			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Abilene, Texas (A)	1	13	0	2818	2853	2061	2061
Albany, New York (A)	252	290	183	6128	7398	6580	6580
Albuquerque, New Mexico (A)	63	61	40	4637	4601	4298	4298
Alpena, Michigan (C)	401	487	465	7024	7884	8127	8299*
Anaconda, Montana (C)	389	480	517	8616	8259	8010	8357**
Asheville, North Carolina (C)	60	80	71	3513	3903	4232	4232
Atlanta, Georgia (A)	1	9	0	2365	2830	2890	2890
Atlantic City, New Jersey (C)	191	222	220	4150	5065	5176	5176
Augusta, Georgia (C)	1	1	0	1620	2289	2161	2161
Baker, Oregon (C)	292	449	431	7595	6734	6950	7163
Baltimore, Maryland (C)	79	80	22	3670	4469	4533	4533
Billings, Montana (A)	216	284	316	7485	6994	7059	7119
Binghamton, New York (C)	231	278	254	5794	6700	6808	6808
Birmingham, Alabama (A)	0	10	0	2285	2765	2352	2352
Bismarck, North Dakota (A)	237	301	338	9048	9245	9147	9192
Block Island, Rhode Island (C)	324	390	378	4940	5955	5689	5788
Boise, Idaho (A)	172	304	236	6468	5966	5552	5552
Boston, Massachusetts (A)	192	313	245	4979	6162	6045	6045
Bozeman, Montana (C)	329	395	471	8431	8037	8195	8521**
Buffalo, New York (A)	248	372	335	5886	6697	6810	6822
Burlington, Iowa (A)	94	167	(a)	6049	6172	(a)	(a)
Burlington, Vermont (A)	273	349	273	6801	8070	7511	7514
Butte, Montana (C)	384	452	502	9141	8692	7926	8235**
Cairo, Illinois (C)	10	24	0	3441	3945	3909	3909
Canton, New York (C)	293	365	334	7013	8148	8020	8020
Charleston, South Carolina (C)	1	0	0	1166	1944	1769	1769
Charlotte, North Carolina (C)	19	12	0	2451	3177	3120	3120
Chattanooga, Tennessee (A)	4	27	0	2848	3239	3118	3118
Cheyenne, Wyoming (A)	409	379	446	7664	7365	7340	7466
Chicago, Illinois (C)	198	324	254	5556	6093	6018	6077
Cincinnati, Ohio (C)	60	89	0	3991	4570	4684	4684
Cleveland, Ohio (A)	175	268	220	5409	6050	6155	6155
Columbia, Missouri (C)	32	80	22	4772	4830	4922	4922
Columbia, South Carolina (C)	6	2	0	1766	2495	2364	2364
Columbus, Ohio (C)	111	155	87	4684	5288	5398	5398
Concord, New Hampshire (A)	308	385	298	6556	7874	7299	7353
Concordia, Kansas (C)	71	113	65	5759	5513	5315	5315
Dallas, Texas (A)	0	4	0	2473	2693	2256	2256
Davenport, Iowa (C)	105	192	118	5893	6165	6289	6289
Dayton, Ohio (A)	146	180	81	5187	7587	5264	5264
Deer Lodge, Montana (C)	366	418	487	8906	8006	8347	8672**
Denver, Colorado (C)	236	202	267	5937	5771	5874	5874
Des Moines, Iowa (C)	85	153	118	6308	6282	6384	6384
Detroit, Michigan (A)	209	298	226	5797	6522	6490	6490
Devils Lake, North Dakota (C)	325	342	424	9870	10145	9874	9970
Dodge City, Kansas (A)	91	124	47	5483	5395	5035	5035
Dubuque, Iowa (C)	140	227	149	6458	6677	6790	6790
Duluth, Minnesota (C)	463	436	521	8570	9312	9267	9483
Eastport, Maine (C)	492	596	543	7039	8032	7398	8520**
Elkins, West Virginia (A)	209	234	177	5256	5584	5697	5697
El Paso, Texas (A)	0	0	0	2930	2908	2428	2428
Ely, Nevada (A)	(a)	504	(a)	(a)	7744	(a)	(a)
Erie, Pennsylvania (C)	217	333	257	5365	6066	6273	6273
Escanaba, Michigan (C)	456	501	490	7669	8397	8608	8771
Evansville, Indiana (A)	54	81	0	4208	4739	4244	4244
Fort Smith, Arkansas (A)	0	21	0	3250	3437	3147	3147
Fort Wayne, Indiana (A)	176	227	130	5691	6368	5925	5925
Fort Worth, Texas (A)	0	4	0	2438	2720	2148	2148
Fresno, California (A)	22	67	0	2755	2611	2334	2334
Galveston, Texas (C)	0	0	0	993	1445	1016	1016
Grand Junction, Colorado (A)	140	118	118	6300	5989	5548	5548
Grand Rapids, Michigan (C)	191	298	174	5868	6467	6535	6535
Green Bay, Wisconsin (C)	287	353	322	7316	7924	7825	7825
Greensboro, North Carolina (A)	46	35	0	3259	3839	3529	3529
Greenville, South Carolina (A)	17	21	0	2618	3166	3380	3380
Harrisburg, Pennsylvania (A)	138	158	90	4824	5490	5375	5375
Hartford, Connecticut (A)	193	254	202	5393	6578	6036	6036
Hatteras, North Carolina (C)	17	3	0	1891	2421	2571	2571
Havre, Montana (C)	202	276	369	8571	7798	8556	8700
Helena, Montana (A)	318	392	402	8830	7862	7663	7894**
Houston, Texas (C)	0	0	0	1283	1557	1157	1157
Huron, South Dakota (A)	173	254	267	7951	8167	8004	8004
Indianapolis, Indiana (A)	126	129	59	5144	5306	5298	5298
Jackson, Mississippi (A)	0	3	(a)	1805	2296	(a)	(a)
Kansas City, Missouri (A)	27	79	6	4874	4962	4956	4956
Knoxville, Tennessee (A)	19	40	0	3126	3442	3670	3670
La Crosse, Wisconsin (A)	184	266	183	7377	7828	7322	7322
Lander, Wyoming (A)	347	343	428	8345	7677	7812	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 104]

Kno-Draft

. . . the completely adjustable Air Diffusers, specified by Western Union for big, high speed communications center at Philadelphia

These Kno-Draft features insure satisfaction.

Fig. 1.

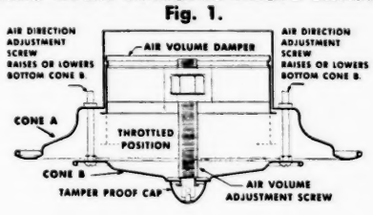
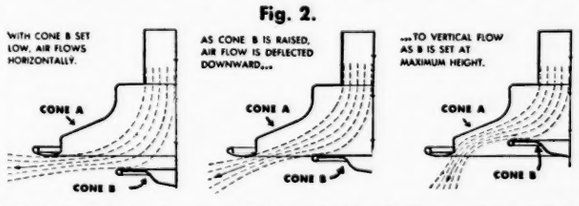

AIR DIRECTION ADJUSTMENT SCREW RAISES OR LOWERS BOTTOM CONE B.
AIR VOLUME DAMPER
AIR DIRECTION ADJUSTMENT SCREW RAISES OR LOWERS BOTTOM CONE B.
CONE A
THROTTLED POSITION
CONE B
TAMPER PROOF CAP
AIR VOLUME ADJUSTMENT SCREW

Fig. 1. Type D Air Volume Control consists of a cylindrical, sliding, sleeve-type damper, connected by a specially designed spider to a centrally operated screw. It varies only the quantity, not the characteristics, of the air distribution. Fig. 2. Any angle of air discharge can be obtained by raising or lowering bottom Cone B.

Fig. 2.


WITH CONE B SET LOW, AIR FLOWS HORIZONTALLY.
CONE A
CONE B
AS CONE B IS RAISED, AIR FLOW IS DEFLECTED DOWNWARD...
CONE A
CONE B
...TO VERTICAL FLOW AS B IS SET AT MAXIMUM HEIGHT.
CONE A
CONE B

In spaces filled with mechanical equipment, cable racks, transmitting machinery and storage partitions, Kno-Draft's facility for delicate regulation of air volume and direction enabled the air conditioning engineers to produce precisely the air pattern best suited for the purpose of each area in the communications center.

The system was balanced to within 5% and the temperatures equalized so evenly that measurements showed a maximum difference of only one-half degree throughout.

FREE HANDBOOK—Send for FREE copy of new handbook on air diffusion. Complete information on Kno-Draft Adjustable Diffusers and all necessary engineering data to help you create "custom-made" air patterns. Just fill in and mail the coupon.

W. B. CONNOR ENGINEERING CORP.

Air Diffusion • Air Purification • Air Recovery

112 East 32nd Street CONNOR **New York 16, N.Y.**

IN CANADA: Douglas Engineering Co., Ltd., 180 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.

Dept. E-40, 112 East 32nd Street, New York 16, New York

Please send my FREE copy of the new Kno-Draft Handbook on Adjustable Diffusers.

Name.....

Position.....

Company.....

Street.....

City.....Zone.....State.....

Degree-Days for May, 1949 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

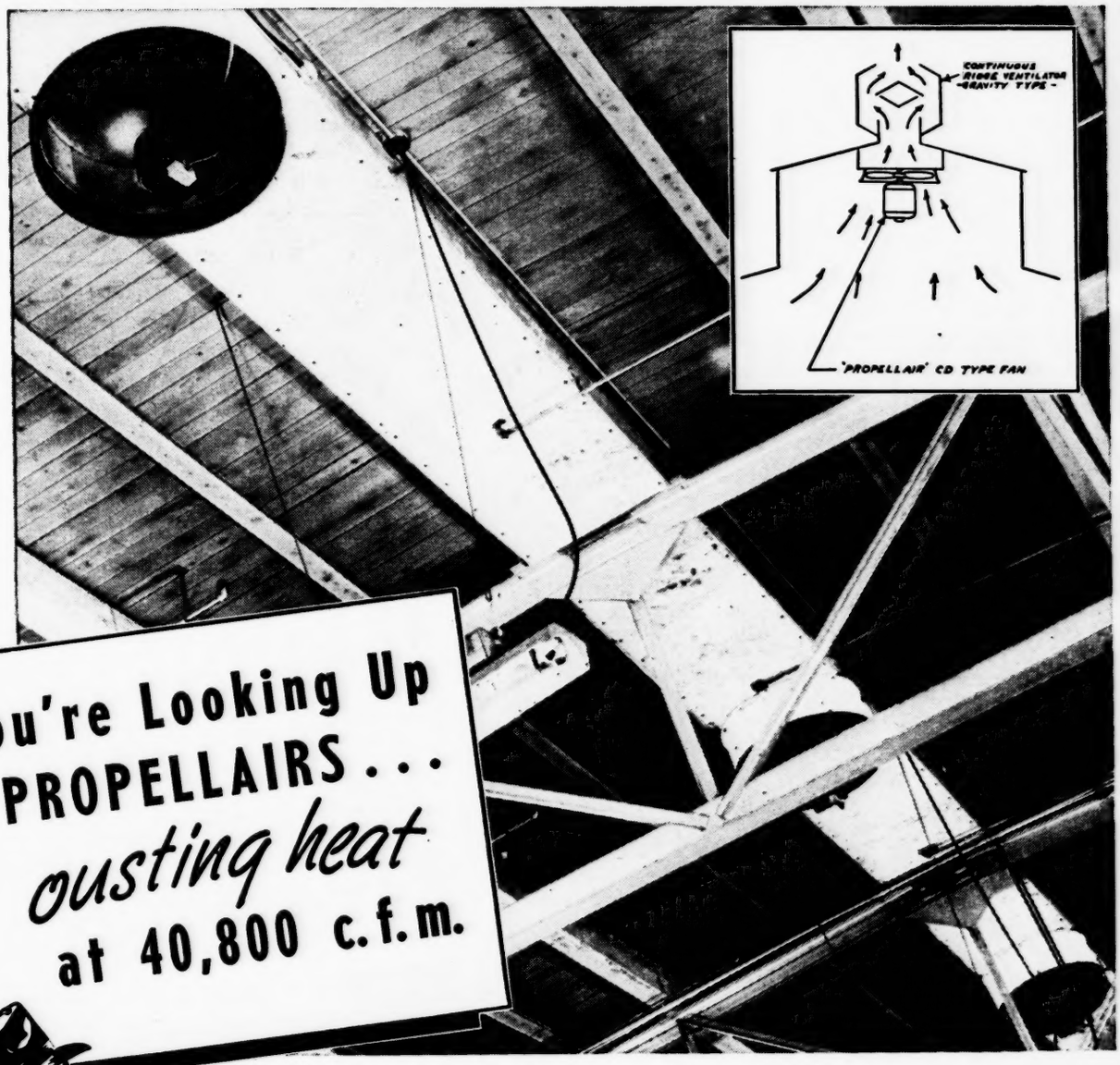
HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

City	May			Cumulative, Sept. 1 to May 31			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Lansing, Michigan (A)	288	335	229	6386	7012	7048	7048
Lewiston, Maine (O)	262	394	344	6433	7710	7662	7707
Lincoln, Nebraska (C)	94	126	99	6287	6017	5999	5999
Little Rock, Arkansas (A)	2	9	0	2847	3223	2811	2811
Livingston, Montana (C)	295	370	405	3287	7340	7043	7245**
Los Angeles, California (C)	76	75	90	1860	1531	1504	1504
Louisville, Kentucky (A)	46	66	0	3938	4351	4180	4180
Lynchburg, Virginia (A)	75	58	0	3673	4259	3980	3980
Macon, Georgia (C)	1	3	0	1770	2337	2201	2201
Madison, Wisconsin (C)	233	310	236	6902	7432	7429	7429
Marquette, Michigan (C)	480	534	496	7669	8292	8464	8693*
Memphis, Tennessee (A)	10	16	0	2818	3371	2950	2950
Meridian, Mississippi (C)	0	4	0	1822	2336	2160	2160
Milwaukee, Wisconsin (A)	291	399	350	6647	7153	7206	7245
Minneapolis, Minnesota (A)	158	228	236	7607	8008	7850	7850
Montgomery, Alabama (C)	0	1	0	1509	2017	1884	1884
Nantucket, Massachusetts (A)	376	421	384	5309	6185	5834	5957
Nashville, Tennessee (A)	19	27	0	3229	3664	3507	3507
New Haven, Connecticut (A)	224	283	223	5155	6338	5895	5895
New Orleans, Louisiana (C)	111	0	0	1011	1402	1024	1024
New York, New York (C)	141	209	171	4241	5357	5244	5274***
Nome, Alaska† (A)	1615	1227	973	12496	12082	13058	14580**
Norfolk, Virginia (C)	49	22	0	2560	3332	3350	3350
North Head, Washington (C)	368	412	422	5009	4639	4693	5452**
North Platte, Nebraska (C)	154	186	199	6773	6103	6366	6366
Oakland, California (A)	192	271	205	3283	3156	2870	3143**
Oklahoma City, Oklahoma (C)	2	43	0	3693	3821	3613	3613
Omaha, Nebraska (A)	157	123	84	6434	6217	6131	6131
Oswego, New York (C)	282	431	357	6063	6976	7025	7088
Parkersburg, W. Virginia (C)	99	133	53	4285	4748	4775	4775
Peoria, Illinois (A)	107	180	121	5728	6012	6109	6109
Philadelphia, Pennsylvania (C)	96	134	115	3968	4913	4720	4737***
Phoenix, Arizona (C)	0	0	0	1818	1651	1405	1405
Pittsburgh, Pennsylvania (C)	116	193	78	4504	5450	5235	5235
Pocatello, Idaho (A)	227	343	332	7370	6934	6595	6655
Portland, Maine (A)	358	467	366	6654	7672	7137	7218
Portland, Oregon (C)	147	253	245	4524	4142	4379	4469
Providence, Rhode Island (C)	186	253	251	4788	5901	6015	6015
Pueblo, Colorado (A)	151	185	186	5806	6025	5514	5514
Raleigh, North Carolina (C)	27	10	0	2606	3363	3234	3234
Rapid City, South Dakota (A)	254	356	344	7593	7101	7088	7118
Reading, Pennsylvania (C)	125	152	96	4450	5288	5389	5389
Red Bluff, California (A)	43	134	(a)	3015	3079	(a)	(a)
Reno, Nevada (A)	323	403	366	6627	6201	5802	5892
Richmond, Virginia (C)	55	39	0	3148	3919	3695	3695
Rochester, New York (A)	238	366	260	6011	6858	6732	6732
Roseburg, Oregon (C)	167	298	267	4486	4355	4314	4428
Roswell, New Mexico (A)	5	24	0	3858	3951	3484	3484
Sacramento, California (C)	69	144	53	2976	2976	2653	2653
St. Joseph, Missouri (A)	44	84	16	5483	5469	5161	5161
St. Louis, Missouri (C)	24	65	0	4311	4622	4585	4585
Salt Lake City, Utah (A)	177	234	236	6659	5979	5555	5555
San Antonio, Texas (A)	0	0	0	1626	1859	1202	1202
San Diego, California (A)	74	85	115	1900	1611	1639	1645
Sandusky, Ohio (C)	155	237	183	5273	5972	6208	6208
San Francisco, California (C)	269	293	264	3055	2747	2681	3264**
Sault Ste. Marie, Michigan (A)	464	516	502	8205	8888	8950	9285**
Savannah, Georgia (A)	2	0	0	1099	1729	1490	1490
Scranton, Pennsylvania (C)	201	238	171	5388	6262	6129	6129
Seattle, Washington (C)	187	313	316	4785	4478	4695	4934**
Sheridan, Wyoming (A)	279	313	403	7861	7407	7888	8008
Shreveport, Louisiana (A)	0	2	0	2029	2454	1938	1938
Sioux City, Iowa (A)	113	188	164	7234	6905	6898	6898
Spokane, Washington (A)	229	395	285	7409	6743	6274	6355
Springfield, Illinois (C)	50	94	56	4926	5162	5373	5373
Springfield, Missouri (A)	35	99	12	4488	4684	4428	4428
Syracuse, New York (A)	243	345	267	5996	7042	6881	6893
Tacoma, Washington (C)	225	340	332	5120	4847	4883	5181**
Terre Haute, Indiana (A)	101	146	0	4944	5459	4872	4872
Toledo, Ohio (A)	193	268	180	5727	6460	6077	6077
Topeka, Kansas (C)	21	76	34	5013	5058	4969	4969
Trenton, New Jersey (C)	142	168	81	4379	5333	4933	4933
Utica, New York (O)	186	309	253	5645	7219	6796	6796
Valentine, Nebraska (C)	170	273	273	7387	6991	7039	7039
Walla Walla, Washington (C)	106	267	171	5478	4970	4808	4808
Washington, D. C. (C)	71	77	25	3640	4368	4626	4626
Wichita, Kansas (A)	30	83	0	4868	4764	4673	4673
Williston, North Dakota (C)	244	313	362	9091	8953	9269	9323
Winnemucca, Nevada (C)	256	335	324	6888	6321	6274	6427**
Yakima, Washington (A)	142	263	186	6489	5821	5599	5599

(a) Data not available.
†Nome data are for April.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.



You're Looking Up to PROPELLAIRS . . . *ousting heat* at 40,800 c.f.m.

A prominent Dayton manufacturer of business equipment was faced with a bad condition in a light-assembly area. A ridge-type gravity ventilator was able to get air movement only when strong crosswinds were blowing over the building. But on a still hot day there was little siphoning effect. Working conditions were unbearable.

As always, when air movement is a problem, a Propellair specialist had the simple, economical answer. The bottom of the gravity ventilator was closed off and three 36" Direct-connected "CD" type Propellair fans were installed on 20-foot centers.

Each 1 HP unit moves 13,600 CFM. Workers could work because there was positive ventilation regardless of wind conditions.

Propellair ventilation is low-cost production assistance. Heat, dust, fumes, moisture are given the gate before they slow down employees or damage machines.

HIGH-VOLUME AIR MOVEMENT AT LOW HORSEPOWER

Type CD direct-connected fan. Sizes 12 to 60 inches. Capacities to 88,000 c.f.m.

PROPELLAIR

DIVISION OF ROBBINS & MYERS • INC.

SPRINGFIELD 94 OHIO

NEW CATALOGS

Expansion Joint Design Guide

A guide to expansion joint selection and application, 28 pages, describes and illustrates with photographs, charts and tables, several types of expansion joints and methods of selection and application. Data are included on expansion, metals, strength analyses, vibration, motion, and other factors. — *Chicago Metal Hose Corp., Maywood, Ill.*

Item 125

Odor Control

A 4-page, 2-color folder presents case histories of odor control problems handled by Airkem vaporizers. —*Airkem Inc., 241 E. 44th St., New York 17, N. Y.*

Item 126

Welding Accessories

A 15-page, 2-color catalog covers both oxyacetylene and electric arc welding accessories, including goggles, hose, sparklighters, gloves, electrode holders, etc.— *Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.*

Item 127

Instantaneous Water Heaters

A 6-page bulletin describes Paracoil instantaneous type water heaters. Dimension and capacity tables for two-pass, four-pass, and six-pass designs are included. All models feature ⅝-inch No. 18 U-shape copper tubes.—*Davis Engineering Corp., 1064 E. Grand St., Elizabeth 4, N. J.*

Item 128

Compressors and Condensing Units

Bulletin 204-5 includes photographs and tables on air cooled and water cooled condensing units for Freon-12 and methyl chloride refrigeration systems. Units are in sizes from ¼ to 10 hp. Data includes sizing and capacity charts on available models.—*Mills Industries, Inc., 4100 Fullerton Ave., Chicago 39, Ill.*

Item 129

Engineered Ventilation

A series of looseleaf bound data sheets and catalog descriptions of ventilating equipment, including roof and turbine ventilators, propeller fans and accessories for industrial ventilation, is included in a new catalog, No. 431. Tables and dimensions show capacities, dimensions and specifications with installation drawings and data on industrial ventilation for heat, dust, fume and moisture removal.—*Allen Ventilator Division, Production Planning Co., Rochester, Mich.*

Item 130

Magnetic Motor Control

A 22-page bulletin, TEB 8, announces a new line of magnetic motor controls intended to give full protection against damage from overload and undervoltage to a-c motors up to 50 hp.—*The Trumbull Electric Manufacturing Co., Plainville, Conn.*

Item 131

Steam Coils

An 18-page bulletin, No. 495, describes and illustrates Marlo ball-bonded steam coils with capacity data and ratings, coil selection data, dimension data, and installation diagrams. A supplementary price list, No. 234, is published separately as pages 39 to 55.—*Marlo Coil Co., 6125 Manchester Ave., St. Louis 10, Mo.*

Item 132

Pipe Tools

A new 52-page catalog describes and illustrates hand-operated pipe tools of all types in capacities up to 12-inch pipe; power pipe machines in three models for ½-inch to 4-inch pipe; power drives in three models for operating geared pipe threaders, and also for other jobs where power is needed; and supplies and accessory equipment.—*Toledo Pipe Threading Machine Co., Toledo, Ohio.*

Item 133

Valves and Fittings

Catalog No. 49 describes and illustrates compression gages, pilot valves, refrigerator valves, steam gages, gas filters, water gages, and other accessories for steam and gas lines. Sizes, prices, and dimensions are included.—*The Roberts Brass Manufacturing Co., 5435 W. Fort St., Detroit 9, Mich.*

Item 134

Cooling Tower

The Verflow cooling tower, a new addition to the Marley line, is announced and described in Bulletin E-49. Verflow, available in both steel and wood, features removable filling, balanced spray system, easy maintenance, special fan, and extra heavy framing. Cross-section drawings and engineering data are included.—*The Marley Co., Inc., Kansas City 15, Kan.*

Item 135

Insulating Blanket

Fiberglas Aerocor, a blanket-like material made of superfine glass fibers, is described in an 8-page, 2-color bulletin. A variety of applications is described and illustrated. A section on the physical properties of the material is included.—*Owens-Corning Fiberglas Corp., Toledo 1, Ohio.*

Item 136

Welding Supplies

A Lincoln directory of welding supplies, Bulletin 467, describes and illustrates electrode holder, clamps, plugs, shields, cables, and other accessories for welding.—*The Lincoln Electric Co., Cleveland 1, Ohio.*

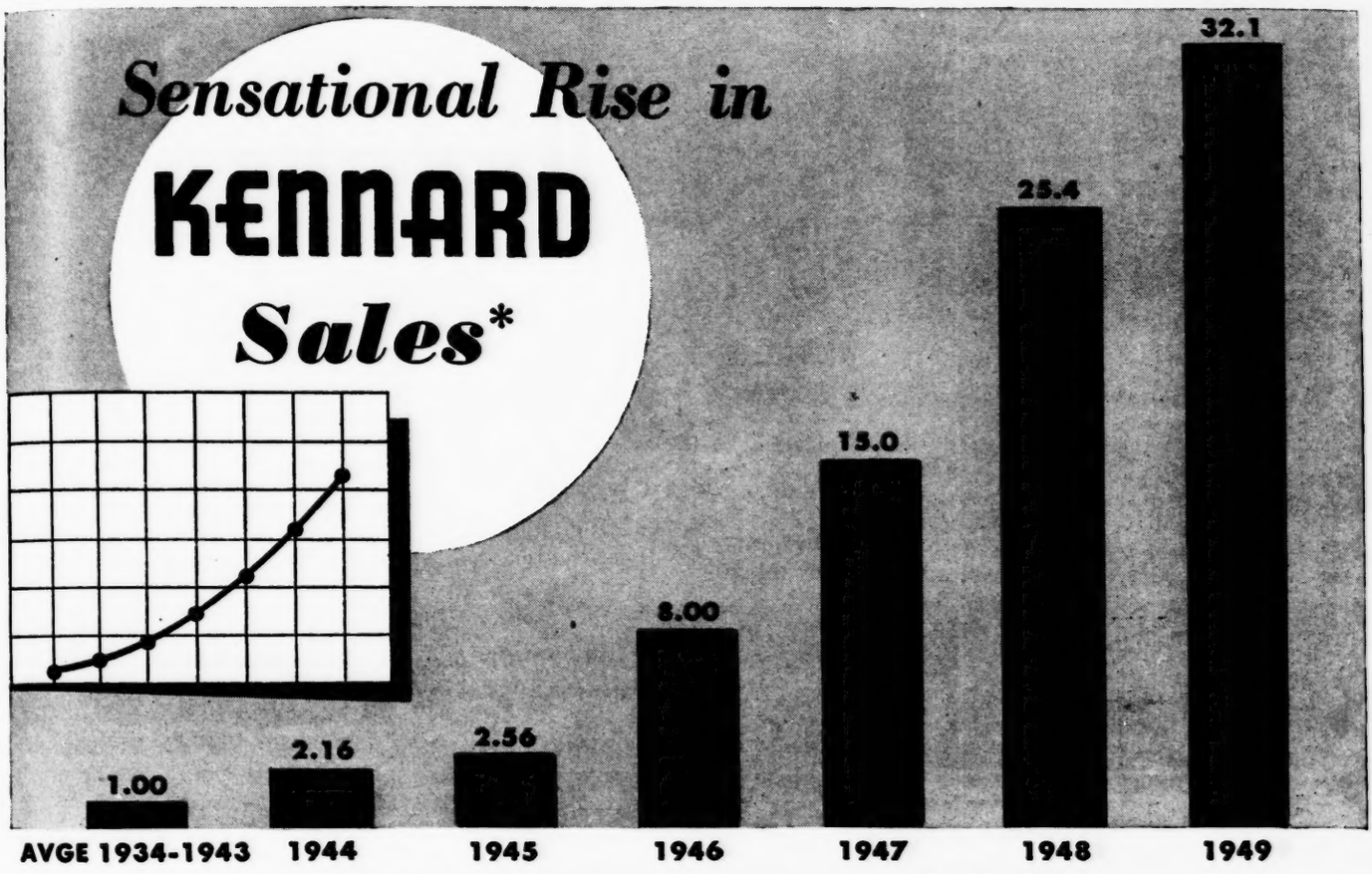
Item 137

Replacement Water Heater Coils

Numbers and list prices of 769 replacement coils for all types of water heaters are listed in a 20-page catalog. Coils for many heaters sold under private brand names, and heaters that are orphaned or discontinued are included. Numbered sketches and photographs of coils aid in ordering.—*Dormont Manufacturing Co., 1314 High St., Pittsburgh 12, Pa.*

Item 138

There MUST be a Reason!



Taken from sales volume records representing unitary dollar volume.

The old adage "nothing succeeds like success" is proved again. We are giving these facts of Kennard's phenomenal growth not in a boastful vein . . . but because *they mean so much to YOU.*

In the face of a growing "buyers' market" with competition becoming razor keen Kennard shoots ahead in sales! Why? Because KENNARD HIGHER QUALITY plus Dollar Savings is a combination that industry acceptance proves in these figures—represents unbeatable intrinsic VALUES.

If you are in the market for heat transfer products (Blast Coils, Air Conditioning Units, Evaporative Condensers or Cooling Towers), we invite you to consult with us now—PROMPT DELIVERIES.

Write for Catalogs and Bulletins

No. 47A—FINNED COILS
No. 486—AIR COND. BLOWER UNITS
No. 491—EVAPORATIVE CONDENSERS
No. 494—COOLING TOWERS

Refinement of detail marks the difference between ordinary and excellent.

KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MISSOURI

Radiant Heating Instruction Book

A 12-page manual of instructions for the building and heating contractor describes and illustrates with photographs and diagrams the methods of installing the Scott-Newcomb radiant heating system. Means of installation in either new houses or existing houses without the necessity of alternation to the house are presented.—*Scott-Newcomb, Inc., 1442 S. Boyle Ave., St. Louis, Mo.*

Item 139

Timing Devices

The 1949 line of Mark-Time switches, coin meters, and timer devices is illustrated in a 6-page catalog containing product descriptions, installation diagrams, and details of special features and accessories.— *M. H. Rhodes, Inc., 30 Bartholomew Avenue, Hartford 6, Conn.*

Item 140

Large Induction Motors

A 32-page booklet gives the ABC of large induction motors, including a brief description of electrical characteristics, power factor, efficiencies, etc. Mechanical construction of large induction motors, a discussion of working principles, characteristics, and applications are included. Drawings and photographs illustrate construction and performance with the EM synchronizer.—*Electric Machinery Manufacturing Co., Minneapolis 13, Minn.*

Item 141

Motor Protection

An 8-page bulletin in two colors describes the Allis-Chalmers Safety-Circle motor which features complete enclosure, double insulated stator, drip-proof end brackets, and is available in sizes from 1 to 20 hp. —*Allis-Chalmers Manufacturing Co., 1172 S. 70th St., Milwaukee, Wis.*

Item 142

Air Recovery

A 4-page, 2-color folder describes the savings and improved conditions resulting from treatment of conditioned air with activated carbon odor removal units. Folder describes use of the new Dorex carbon filter.— *W. B. Connor Engineering Corp., 114 E. 32nd St., New York 16, N. Y.*

Item 143

Synthetic Lubricants

A 28-page booklet describes Ucon brand fluids and lubricants and their uses for the lubrication of machinery, internal combustion engines, rubber products, and instruments. Uses as hydraulic fluids, leather conditioning agents, plasticizers, softeners, solvents, demulsifiers, defoamers, and heat transfer fluids are also described. Physical properties for both water soluble and non-soluble grades are presented.—*Carbide & Carbon Chemical Corp., 30 E. 42nd St., New York 17, N. Y.*

Item 144

Varidrive Motors

A 16-page booklet, Section 300, includes data and photographs on U. S. varidrive motors, slower speed addition to the line, wider speed variation, prices, frames, types and speeds of driving motor. — *U. S. Electrical Motors, Inc., Los Angeles 54, Calif.*

Item 145

Wound Rotor Motors

Bulletin SR-1 describes Howell wound rotor machines, slip ring motors up to 150 hp at 1,800 rpm. Photographs and charts illustrate performance characteristics and construction details. A table of specifications and dimensions is included. — *Howell Electric Motors Co., Howell, Mich.*

Item 146

Pumps and Compressors

A series of booklets and looseleaf inserts describes Worthington's ammonia booster compressors and dry vacuum pumps, ammonia product coolers, self-priming centrifugal pumps, water and oil lubricated vertical turbine pumps, and packaged air conditioners. — *Worthington Pump & Machinery Corp., Harrison, N. J.*

Item 147

Refrigerant Purger

How air and other non-condensables get into refrigeration systems; the adverse effect this has on operating costs and efficiency; and what the Armstrong forged steel purger does to prevent it is the subject of an 8-page bulletin, No. 192. Installation data, specifications, and prices are included.—*Armstrong Machine Works, Three Rivers, Mich.*

Item 148

Air Meter

Instantaneous readings of air velocities from 10 fpm to 6,000 fpm and temperature measurements from 30F to 155F are credited to the Anemotherm air meter in a new 4-page folder, Bulletin 25A. Instrument also gives direct readings of static pressure in inches of water, is portable, and operates on self-contained batteries. — *Anemostat Corporation of America, 10 E. 39th St., New York 16, N. Y.*

Item 149

Freon Condensers

Catalog No. 23-B describes and illustrates Acme Freon condensers, shell and tube models, with tables and charts to guide in selection and a discussion of selection methods and engineering data. — *Acme Industries, Inc., Jackson, Mich.*

Item 150

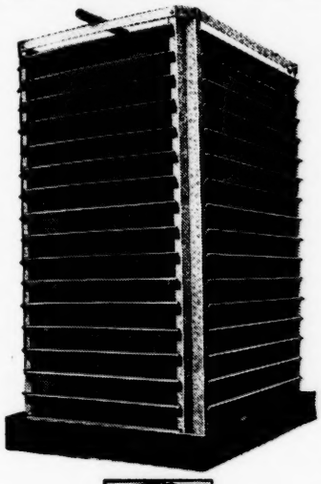
House Heating

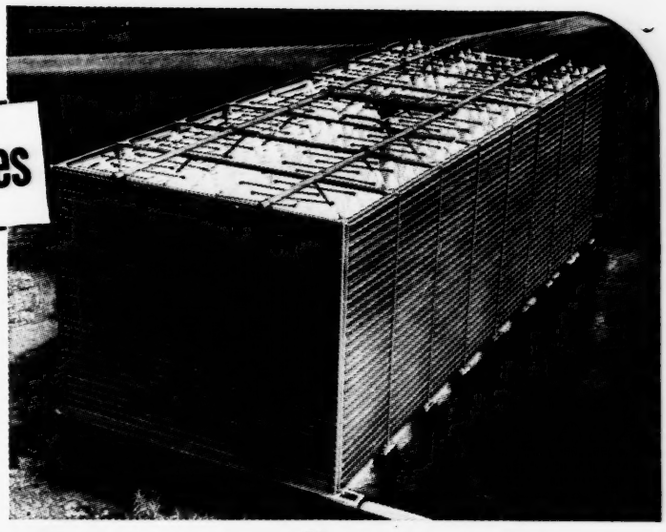
A 24-page, 2-color guide for home builders describes ten ways to heat your new home and includes a description of all types of fuel and all types of heating systems in popular use.—*Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. S., Minneapolis 8, Minn.*

Item 151

Binks NATURAL DRAFT COOLING TOWERS

30 standard sizes





Binks Type "S" Cooling Towers are manufactured in capacity ranges from 10 to 1200 GPM. This wide range of sizes enables you to choose exactly the tower you need to fit your requirements without the needless expense of a custom-built unit. Binks Type "S" Towers are the accepted standard for cooling condenser circulating water from refrigeration and air conditioning compressors, and for cooling water-jacketed engines. They will provide low cost cooling of highest efficiency for any manufacturing process where heat is dissipated by circulating water or other fluids.

Send today

for bulletins describing the Binks Type "S" natural draft cooling towers in which you are interested.

BULLETIN NUMBERS:

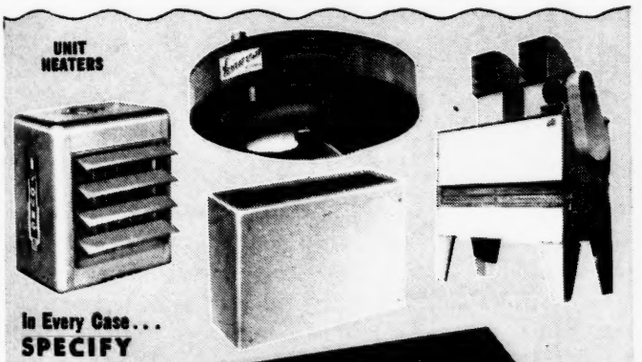
30. Single Section Towers
31. Multiple Section Towers (one bay wide)
32. Large Capacity Towers
40. All Redwood Towers

Please state how tower will be used, also capacity required.

THERE'S A BINKS TOWER FOR EVERY COOLING JOB

Binks MANUFACTURING COMPANY

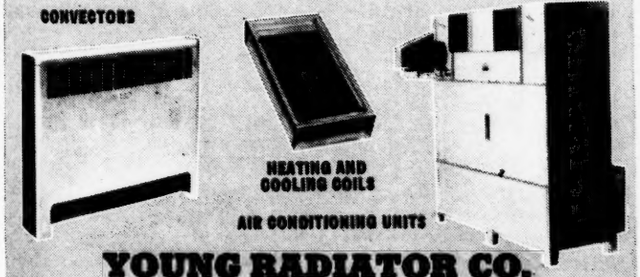
REPRESENTATIVES IN ALL PRINCIPAL CITIES ■ 3120-38 CARROLL AVENUE, CHICAGO, ILL.



In Every Case... SPECIFY

Young

SPECIALISTS IN HEATING, COOLING AND AIR CONDITIONING EQUIPMENT FOR HOME AND INDUSTRY



YOUNG RADIATOR CO.

General Offices: Racine, Wisconsin, Dept. 819-G
Plants at Racine, Wisconsin, and Mattoon, Illinois
Sales and Engineering Offices in All Principal Cities

AIR-FLO

AUTOMATIC

CEILING SHUTTER

FOR ATTIC FAN

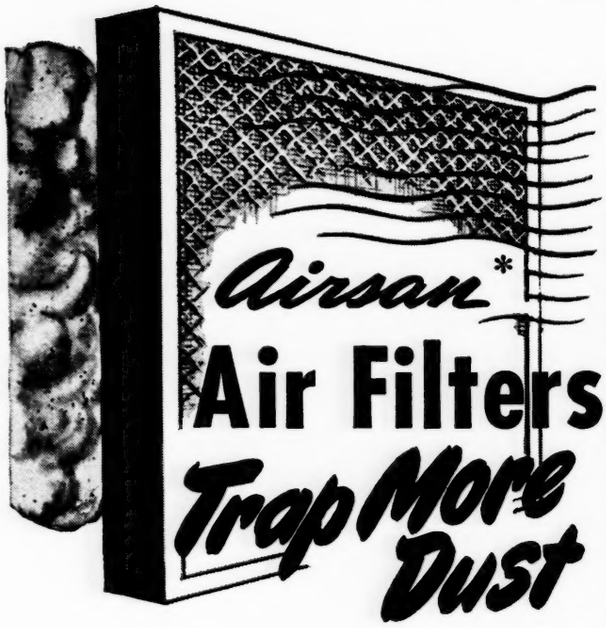
Built so they can be installed practically flush with the ceiling, AIR-FLO Ceiling Shutters present a refined, finished appearance. Their natural aluminum color blends with any decoration, eliminating need for painting, and no grille or winter cover is required. Furnished in 5 different widths, single panel up to 73" long. No operating mechanism shows. Built-in fusible link. Meets fire underwriters requirements.

WRITE FOR NEW CATALOG 43-F

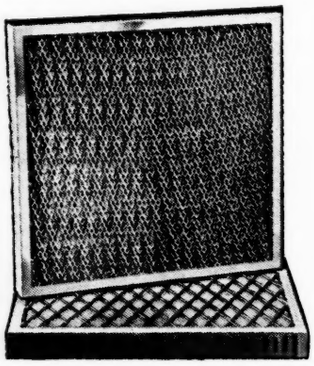
Illustrations and details of the complete AIR-FLO line.

AIR CONDITIONING PRODUCTS CO.

2340 W. LAFAYETTE BLVD. · DETROIT 16, MICH.



For Air Conditioning, Heating and Ventilating



Greater efficiency — lower resistance is yours with an AIRSAN Air Filter.

A permanent, cleanable viscous type filter of all galvanized construction, having full bronze welded corners. Expanded metal face plate acts as lint arrestor to provide easier cleaning and servicing. Rated filtering efficiency 98.5%. In standard 1" and 2" thickness.

Also available for heavy duty service on industrial and special applications — in 2" to 4" thickness. Holding frames (for V-type or straight banks) are made for all type filters.

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FORMERLY AIRCOR

Air Filter Corporation

108H No. Water St. Milwaukee 2, Wis.

Canadian Representative: DOUGLAS ENGINEERING CO., Ltd. Montreal

Airsan

Cathodic Protection

Educational Bulletin No. EB-104 gives corrosion data and test results on cathodic protection of galvanized hot water storage tanks by use of galvanic magnesium alloy anodes. The 16-page bulletin is an article by D. J. Fergus, Research Engineer, and carries no advertising. — *The Cleveland Heater Co., 2310 Superior Ave., N.E., Cleveland 14, Ohio.*

Item 152

Protective Coatings

A 4-page folder covers Perma-skin vinyl corrosion resistant protective coatings for metal, wood, stone, brick and concrete structures and equipment. Full protection against atmosphere and chemicals.—*Dennis Chemical Company, 2701 Papin Street, St. Louis 3, Mo.*

Item 153

Unit Header Fabrication

Advantages and economies of factory unit fabrication of welded piping headers, assemblies and valve groupings into one-piece, pre-tested units are described and illustrated in a 4-page bulletin. — *Crane Company, 836 S. Michigan Avenue, Chicago 5, Ill.*

Item 154

Propeller Fans

Application of propeller fans to ventilation problems in industrial, commercial and institutional buildings is described in a 12-page booklet, Bulletin 3146. These basic fan models are described and illustrated. Installation photographs are included. — *Herman Nelson Corp., Moline, Ill.*

Item 155

Self-Priming Pumps

Six stationary models of Deming self-priming centrifugal pumps with capacities from 10 to 300 gpm against heads up to 250 ft, are described in a 4-page folder with capacity tables and performance details. Some models are adaptable to corrosive liquids.—*The Deming Co., Salem, Ohio.*

Item 156

JULY, 1949

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using item number at the end of each review. Print your name and address, mail to

Editor, HEATING AND VENTILATING
148 Lafayette Street, New York 13, N. Y.

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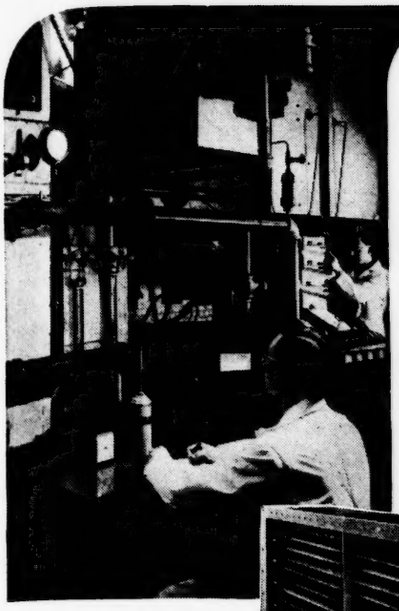

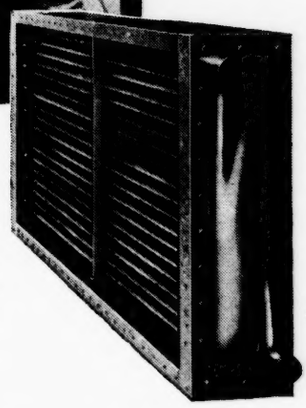

Aerofin heat-transfer surface is available in a complete range of sizes, designs and materials for heating and cooling application. Write for information.

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Fin-Type Heat Exchangers

You get all three — accuracy, efficiency and dependability — when you install Aerofin heat-transfer surface. Continuous research has led to the development of extremely accurate ratings — you can install to full capacity with complete confidence. And Aerofin's unequalled experience and facilities in the exclusive manufacture of fin-type surface for 26 years assure you of dependability and maximum efficiency.

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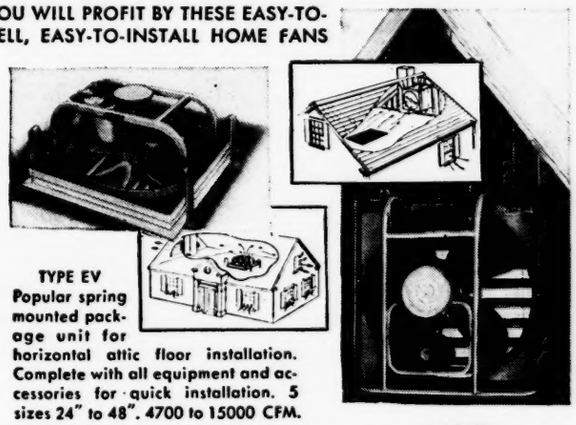
Provide summer cooling with

CHELSEA COMFORT COOLERS

YOU WILL PROFIT BY THESE EASY-TO-SELL, EASY-TO-INSTALL HOME FANS



TYPE EV
Popular spring mounted package unit for horizontal attic floor installation. Complete with all equipment and accessories for quick installation. 5 sizes 24" to 48". 4700 to 15000 CFM.

TYPE EH
Brand new spring mounted package unit for vertical attic installation. Easy to install with minimum building alteration. 9 models from 24" to 60". 5000 to 25000 CFM.

ALSO 4 *NEW* WINDOW FAN MODELS FOR QUICK "OVER-THE-COUNTER" SALES!

Sizes from 12" to 30"—single and variable speeds. Ideal for installation where permanent Comfort Coolers are less adaptable. 1000 to 8200 CFM.

WRITE FOR CATALOG 863 describing Window Fans and the complete line of Comfort Coolers from 24" to 60"

CHELSEA FAN & BLOWER CO.
INCORPORATED
1206 GROVE STREET IRVINGTON 11, NEW JERSEY

Automatic

REZNOR

gas-fired unit heaters

REZNORS TOP THE MARKET IN SALES VOLUME

There's more profit for you now in selling the nation's No. 1 choice of unit heater. Reznors lead all others in sales. There's a size for every need. Write for catalog.

REZNOR MANUFACTURING CO.

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for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES

FAN-TYPE FOR FLAT SLICING SPRAY

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. - - Write for Bulletin N-616.

YARNALL-WARING COMPANY
104 Mermaid Avenue Philadelphia 18, Pa.

Getting Personal

C. H. Koper

Charles H. Koper *(79 Pointers for the Selection, Arrangement, and Piping of Unit Heaters*, page 67) not only has the technical knowledge but also has had the practical experience from working as a journeyman steamfitter for several years before entering the heating contracting business as an engineer and estimator. He next worked in a consulting engineer's office for five years before entering sales engineering where he has spent the past 18 years. The last 10 years were spent with the Sturtevant Division of the Westinghouse Electric Corp. as a consultant to distributors of unit heaters until his resignation in July, 1948. A registered engineer, he is a member of the National Society of Professional Engineers and ASHVE.

T. H. MacDonald

Torrence H. MacDonald (co-author, *Average Solar Radiation in the United States*, page 61) was born in Ohio and brought up in Montana. After experience on various ranches and as a lumberjack he joined the Weather Bureau in 1929. Part-time schooling led to a degree at Montana State University (mathematics, honors) which was followed by a year's fellowship in meteorology at California Institute of Techonology, compliments of the Weather Bureau. During the war he was assigned to a joint Air Forces-Weather Bureau research unit where he was mainly concerned with use of de-icing equipment on military aircraft. Recently, as a member of the meteorological physics section of the Weather Bureau, he has been researching on the amount of solar radiation absorbed and reflected by clouds, and has made numerous aircraft flights to obtain measurements of these variables.

(Biographical sketch and photograph of Sigmund Fritz, co-author with Mr. MacDonald, appeared in the January, 1949, issue with his article on Solar Radiation on Cloudless Days.)

C. L. Ringquist *(Cooling of Quenching Oils*, page 49) received his Bachelor of Science in Mechanical Engineering from the University of Illinois in 1929. After graduation he joined The Trane Company of La Crosse, Wis. as a sales

C. L. Ringquist

L. J. Hess

engineer at the Indianapolis sales office. After two years he transferred to the home office and assisted R. H. Anderegg in developing the air conditioning department.

Where you have heat, smoke and fumes in concentrated quantities, it takes *power* to expel these elements fast enough to clear the atmosphere for greatest comfort. Swartwout Ject-O-Valve forces contaminated air outside before it spreads through workrooms—draws *fresh* air in from outer walls.

Ject-O-Valve (patent applied for) is sturdy, powerful, efficient. It literally "throws" bad air *out* and *up*. The top is open only when fan is running. Weatherproof at all times. Made in 5 sizes, 28 capacities—6,400 to 46,500 C.F.M.

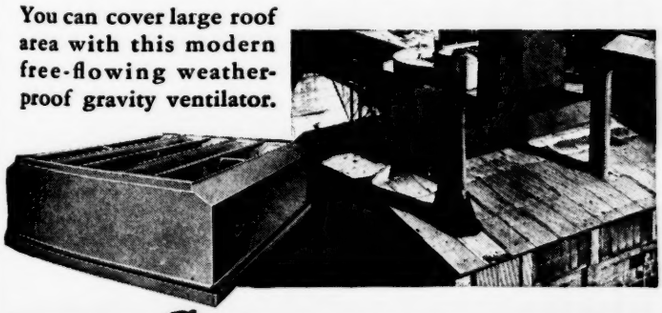
It pays you to have this flexible ventilation facility, to help keep workers satisfied, more efficient. Write for full information.

THE SWARTWOUT COMPANY

18571 Euclid Ave., Cleveland 12, Ohio

Swartwout *AIRMOVER* for "open roof" ventilation

You can cover large roof area with this modern free-flowing weatherproof gravity ventilator.



Swartwout *Controlled* **Air Circulation**

EQUIPMENT FOR EFFECTIVE MECHANICAL VENTILATION OF INDUSTRIAL BUILDINGS

THE NEW DURIMET 20, ANTI-CORROSION SHEET AND PLATE

As Easy To Fabricate As Ordinary Stainless

To give the fume hoods and ducts in your chemical laboratory lasting corrosion-resistance make them of the new Durimet 20 sheet.

This newly developed form of Durimet 20 can withstand really tough corrosives. Its resistance is far better than ordinary stainless steels or even previous analyses of Durimet.

This corrosion resistance is as permanent, uniform and thick as the sheet itself. There is no lining to chip, crack or spall and leave the duct vulnerable. A Durimet 20 duct encloses laboratory fumes with a solid wall of corrosion-resistance.

This special stainless steel can be easily fabricated by methods familiar to ventilating contractors experienced in handling 18-8 stainless. It forms a light, strong, lasting fume passageway. Use it for laboratory table tops, sinks and troughs, too.

Write for Bulletin 502.

THE DURIRON CO., INC. • DAYTON 1, OHIO

Branch Offices In Principal Cities

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CORROSION RESISTING ALLOYS & EQUIPMENT

New AUER de luxe

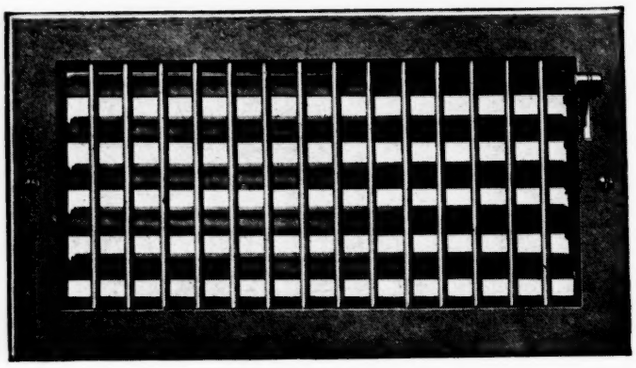
"Streamliner"

Multiple Deflection

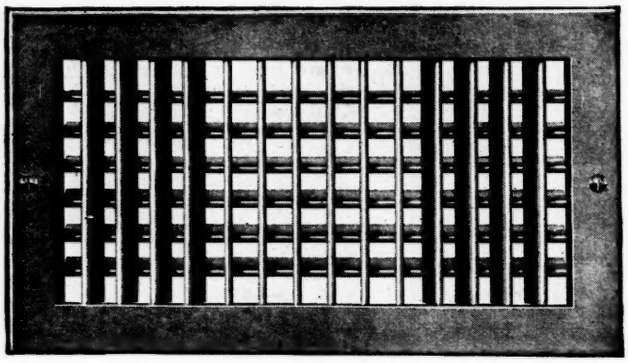
Air Conditioning

REGISTERS and GRILLES

— for high velocity outlets



1005V-HML. Single bank of bars, multi-louvre valve.



1205VH. Double bank of bars, no valve.

Streamliner registers and grilles for air conditioning systems provide **better** diffusion for high velocity outlets. The Series includes models with single bank of adjustable bars (vertical or horizontal), also with double bank of adjustable bars (vertical in front and horizontal in back, or the reverse), also all above four types with horizontal multi-louvre valves in the rear, controlled by lever on face of register.

Design of bars and method of mounting them are **original** with Auer. Bars are hollow moulded, beveled, perfectly formed, smooth in contour, and pivoted in the frame on special split sleeves. This expansion insert furnishes correct tension to hold bars firmly where set, yet allows sufficient free movement for adjustment with one simple tool. Bars may be set at any angle, in any grouping. Blades of multi-louvre valve are pivoted on rivets to prevent vibration. Streamliner registers are equipped with gaskets. You will be pleased with the beauty and fine craftsmanship of these registers. Write for folder S-49.

Complete Auer Register Book—or Catalog "G" on perforated grilles—sent on request.

THE AUER REGISTER CO., 3608 Payne Avenue, CLEVELAND 14, OHIO

Auer REGISTERS & GRILLES for AIR CONDITIONING & GRAVITY

He has been manager of that department since 1939. Mr. Ringquist has recently received recognition as the designer of Trane Custom-Air and UniTrane air conditioning systems. He is a registered professional engineer, a member of ASHVE and is the author of several technical articles on controls.

L. J. Hess (co-author, *Cooling of Quenching Oils*, page 49) was born in St. Marys, Ohio, and attended Purdue University, La Fayette, Indiana, before entering the Army Air Forces Technical School at Yale University. After completing this training he rounded out four years of duty as an Aircraft Engineering Officer in this country and in the European Theater of Operations. Upon being discharged, Mr. Hess returned to Purdue and received his Bachelor of Science in Mechanical Engineering. He has since been employed as a sales engineer in the air conditioning department of The Trane Company, La Crosse, Wisconsin.

. . . Since the Last Issue

Robert E. Marshall has been elected secretary of the **Worthington Pump and Machinery Corp.**, succeeding the late **C. Neal Barney.** Mr. Marshall, a graduate of Amherst College and Harvard Law School, was admitted to the New York Bar in 1937 and to the New Jersey Bar in 1942 and has been associated with the corporation since 1947, serving as a member of the legal department, counselor on industrial relations, and assistant secretary.

The appointment of **Dr. Max R. Burnell** of Flint, Mich., as medical consultant to **General Motors** has been announced. Dr. Burnell, medical director of the AG Spark Plug Division of GM since 1931, and a practicing physician in Flint for 28 years, succeeds **Dr. Clarence D. Selby,** who is retiring after 14 years' service as GM's medical consultant.

All officers and Class B directors of **Bituminous Coal Research, Inc.,** were reelected during the annual membership meeting of BCR in Columbus, Ohio.

Robert S. Fleshiem has been promoted from manager of **Allis-Chalmers** electrical department to assistant to **W. C. Johnson,** executive vice president of the company's general machinery division. In his new post he succeeds **J. D. Greensward,** recently named general manager of the company's Norwood (Ohio) Works. **Roy M. Casper,** who has been manager of Allis-Chalmers motor and generator section, becomes manager of the company's electrical department.

Henry W. Wendt, chairman of the board of **Buffalo Forge Co.,** has announced the election of two new directors, **Charles C. Cheyney** and **Arthur M. Kiely,** increasing the number of directors from five to seven, authority for which was granted by the stockholders in a special meeting on May 27, 1949. Mr. Cheyney started his career with Buffalo Forge Co. in the engineering department and after serving as a lieutenant in the Naval Air Force in World War I, he returned to the company to take charge of the Chicago office. Recalled to Buffalo in 1928 as assistant sales manager, he later became sales manager, in which position he continues. Mr. Kiely, during the early part of 1930, made a financial survey in South America for the Buffalo Forge Co. and upon his return became connected with the company in work covering financial and tax matters. Mr. Kiely continues as controller of the company, a position which he has held since 1941.

Frederick H. Blackmore, vice president in charge of manufacturing of the **United States Radiator Corp.,** has retired after 49 years of service with the corporation, and one of its predecessors.

weil "TVC" CONDENSATE
FOR LOW PRESSURE SYSTEMS

(WRITE FOR BULLETIN TVC-300)

LOW RETURN CONNECTION

CAST IRON RECEIVER

WATERLINE EXTREMELY LOW

Provides Freedom of Layout
Permits Overhead Lines
Capacities—500 to 10,000 sq. ft. E.D.R.

Fig. 302

Guaranteed Performance

- Precision built for longer life
- Every pump part made and assembled in the Weil factory
- Pre-tested before shipping
- Pump comes completely assembled

OTHER TYPES

TYPE R
Hot and chilled water circulating
Ball bearing—once a year lubrication
Capacity—10 to 750 GPM
(write for Bulletin R5500)

TR HORIZONTAL
Low and high pressure systems
Ball bearing—heavy duty
Capacities to 100,000 sq. ft. E.D.R.
Pressures to 125 P.S.I.

weil PUMP COMPANY

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CHICAGO 22, ILLINOIS

GENERAL CONTROLS

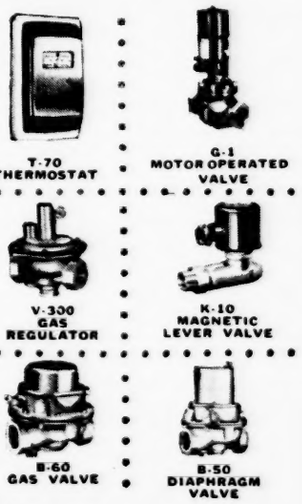
Takes the MANual out of Controls

They're Automatic!

For all *Pressure, Temperature, Level and Flow Control* applications using all kinds of gases, liquids, and air.

It's profitable! Because antiquated automatic or manually operated controls hold down your profits! That's true whether you are a manufacturer, wholesaler, dealer or user.

- "ALL-GAS" CONTROL SYSTEMS
- AIRCRAFT CONTROLS, ELECTRIC
- AUTOMATIC SAFETY SHUT-OFF VALVES
- MOTOR OPERATED VALVES
- MAGNETIC GAS VALVES
- SOLENOID VALVES
- THERMOSTATIC CONTROLS & CONTROL SYSTEMS
- GOVERNOR-TYPE VALVES
- HI-LOW-OFF VALVES
- DIAPHRAGM VALVES
- LIMIT CONTROLS
- ELECTRIC TIME SWITCHES
- REFRIGERATION VALVES
- GAS REGULATORS
- LOW WATER CONTROLS
- STRAINERS, RELAYS
- TRANSFORMERS, SWITCHES
- PORTABLE EQUIPMENT CONTROLS
- MACHINE TOOL CONTROLS

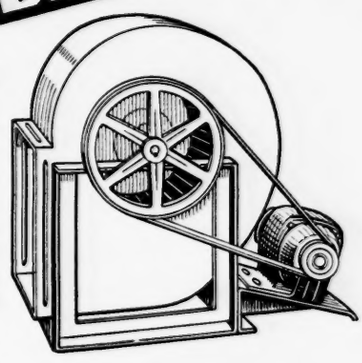


GENERAL CONTROLS

Manufacturers of Automatic Pressure, Temperature, Level & Flow Controls

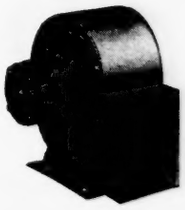
Factory Branches: Birmingham (3), Boston (16), Chicago (5), Cleveland (15), Dallas (2), Denver (10), Detroit (8), Glendale (1), Houston (6), Kansas City (2), New York (17), Oklahoma City (1), Philadelphia (40), Pittsburgh (22), Seattle (1), San Francisco (7), St. Louis (12) • **DISTRIBUTORS IN PRINCIPAL CITIES**

HY-DUTY BLOWERS



● There's a Hy-Duty properly sized for hundreds of jobs where large volume, low velocity and quiet are demanded—double inlet or single—top or bottom motor mounting—all discharge positions—200 c.f.m. to 15,000—heavily constructed—looks and finish to stack up with the best jobs and priced right.

Announcing . . .



A new, high powered, quiet, direct driven, single inlet Hy-Duty blower with a wheel 5" diameter, 3" wide. Immediate delivery, attractive price, suitable for a multitude of small air handling jobs.

AIR HANDLING AT ITS QUIETEST BEST

● SEND FOR LITERATURE AND ENGINEERING INFORMATION

BLOWERS • ATTIC FANS • EXHAUST • PORTABLE OR WINDOW FANS

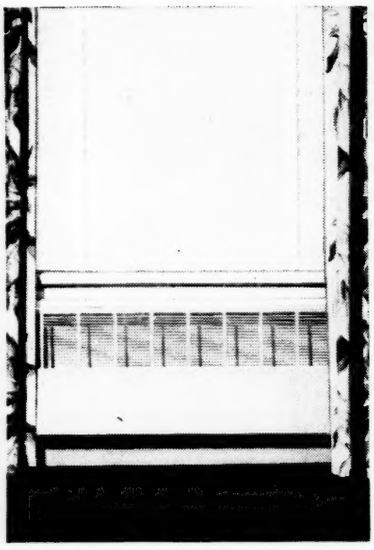
SCHWITZER-CUMMINS COMPANY
VENTILATING DIVISION • INDIANAPOLIS 7, INDIANA
Fine Blowers and Fans for over 30 Years

AMERICA'S MOST COMPLETE LINE OF CONVECTOR-RADIATORS

NOW... Fedders makes Convector-Radiators in America's most *complete* range of types and sizes as follows:

Type F	Type SFB	Type RC
Type FE	Type W	Type RCB
Type FB	Type S	Type P
Type SF	Type R	Type PB
	Type RB	

QUICK RESPONSE



to manual and thermostatic control is an important reason for using Fedders Convector-Radiators. They are equipped with heating elements using copper tubes and aluminum fins,—the most efficient commercial heat transfer metals.

By reducing time lag, Fedders Convector-Radiators provide quick control and more uniform temperature, greater comfort and increased fuel economy.

Write for Complete Information

FEDDERS-QUIGAN CORPORATION

BUFFALO 7, N. Y.

A Great Name Since 1896

fedders

Howard R. Roberts, Whiting Corp., Chicago, Illinois, was elected chairman of the Food Freezer Section of the **Refrigeration Equipment Manufacturers Association** at its meeting in Washington, D. C., on May 25. Other officers elected are **J. W. Krall,** Tyler Fixture Corp., vice chairman, and **C. H. Beane,** Brewer-Titchener Corp., secretary. They will hold office until May 1, 1950.

G. L. Drake

The recent appointment of **George L. Drake** as advertising manager has been announced by **Fedders-Quigan Corp.,** Buffalo, New York. Mr. Drake will work with the several sales managers in directing the company's advertising program in each of the various sales divisions. He has been engaged in various phases of advertising, promotion and public relations for a number of years, with the exception of four years spent in active duty with the U. S. Navy. He was most recently associated with Deepfreeze Division, Motor Products Corporation. **Batten, Barton, Durstine & Osborn, Inc.,** has been appointed to handle advertising of Fedders room air conditioners.

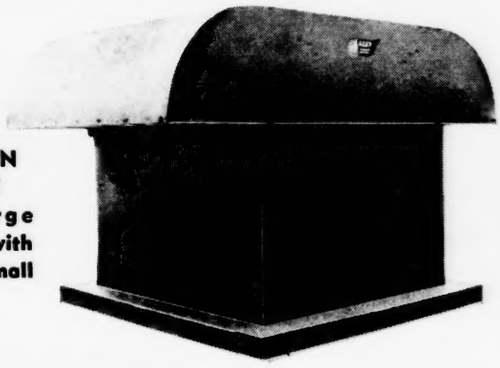
E. W. Pat Smith is appointed director of merchandising of **Owens-Corning Fiberglas Corp.** Mr. Smith, who joined the Fiberglas Corp. in April as special assistant to the general sales manager, was formerly vice president for sales of the Philip Carey Manufacturing Company. **Edward C. Ames,** who has been director of advertising on an interim basis for two years, was named director of public relations and publicity.

The appointment of **George M. Frazer** as market analyst for the Janitrol space heating equipment division of **Surface Combustion Corp.** has been announced. Previously associated with the Lennox Furnace Company, Marshalltown, Iowa, as market research director, Mr. Frazer has been a frequent contributor of articles to the leading home and trade magazines in the heating and building fields. Mr. Frazer will operate from the Toledo headquarters of Surface Combustion Corp.

T. M. Gallagher, Hatboro, Pa., has been appointed by the **Armstrong Furnace Co.,** Columbus, Ohio, as district manager for the eastern Pennsylvania, Delaware, New Jersey, eastern Maryland, District of Columbus and northern Virginia area comprising the Philadelphia district

Westinghouse Electric Corp., Pittsburgh, Pa., announces comprehensive executive changes involving new or substantially altered responsibilities at the vice presidential level. Vice president **L. E. Osborne,** primarily an operations official heretofore, is assigned staff supervision over all the company's manufacturing activities, including all matters of production and industrial relations. Simultaneously he retains operating responsibility for five major manufacturing divisions. **James H. Jewell,** recently elected vice president, takes over staff supervision of all sales and marketing on a company-wide basis. **John K. Hodnette,** vice president and head of the Transformer Division at Sharon, Pa., becomes general manager of industrial products with headquarters at Pittsburgh. Reporting to him will be all operating divisions making industrial goods as well as the district sales organizations which sell these goods. His successor at Sharon has not yet been announced. **John M. McKibbin,** also a recently elected vice president and former head of advertising and sales promotion, now is appointed general manager of consumer products with responsibility for operation and distribution of the Appliance Division and the Home Radio Division. Mr. McKibbin will make his headquarters at Pittsburgh. This marks the first time responsibility for industrial products has been separated from consumer product responsibility at top level reporting directly to the president.

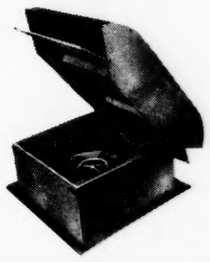
ALLEN HIGH EFFICIENCY ROOF FAN



POWER CONSUMPTION VERY LOW! Exhausts large volume of air with comparatively small motors.

Designed for flat roof or level curb installations. Replaces old-style penthouse with louvers—lower initial cost, lower over-all height (less affected by high winds). Exhausted air is thrown downward at opposite ends of hood. Counterbalanced dampers, held open by air stream, close by gravity when fan stops. To install, merely cut opening in roof, flash fan to roofing material, connect electrically. Rugged, weatherproof. Available in wide range of capacities (750 to 45,000 cfm), many sizes, and in Standard, Direct Drive and Remote Drive types. Write for catalog on complete line of roof ventilators.

To inspect or service, simply remove two bolts and tilt hood (see below). Or remove four bolts and take hood off completely.

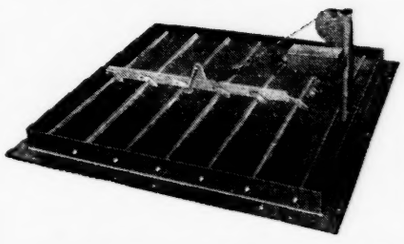


Representatives in most principal cities

ALLEN VENTILATOR DIV.
PRODUCTION PLANNING COMPANY
Rochester, Michigan

New!

CEILING SHUTTER
with Mercury Switch . . . for Attic Ventilation



HAS 2 SAFETY FEATURES

THE "Celo" Type Ceiling Shutter introduces two important safety features in attic ventilation. FIRST, it synchronizes the starting and stopping of the fan with the opening and closing of the shutter. SECOND, it provides automatic closing of the shutter and automatic stopping of the fan in case of fire.

Built in square sizes by the inch from 24" x 24" to 48" x 48", and in rectangular sizes from 12" to 48" wide, and up to 72" long. Also supplied without mercury switch, if desired.

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
2738 W. Warren Detroit 8, Mich.

Follow up this

BIG LINE

to greater heating profits

Commercial Stokers

Domestic Stokers

Oil Furnaces

Coal Furnaces

Water Heaters

Gas Furnaces

Boilers

Oil Burners

STOKOL

- A Heating Line you will be proud to sell.
- A complete Heating Line of types and sizes.
- A Line of Commercial and Domestic Stokers.
- A moderately-priced Heating Line.
- A fine quality Heating Line.
- A big name Heating Line made famous by years of national advertising.
- A Heating Line that will enable you to successfully compete on price, quality, reputation and provide a wide variety of home and commercial installations.

CLIP AND MAIL THIS COUPON
WHILE GOOD TERRITORY IS STILL AVAILABLE

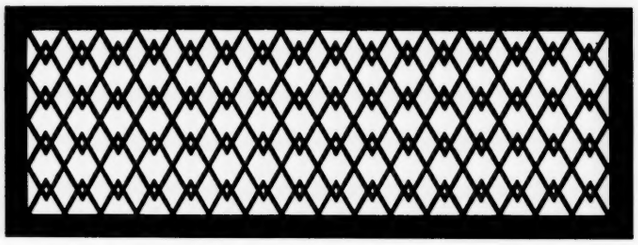
STOKOL-STOKER CO., INC.
DAYTON 1, OHIO

Please send me complete information on the BIG STOKOL LINE.

Name_____

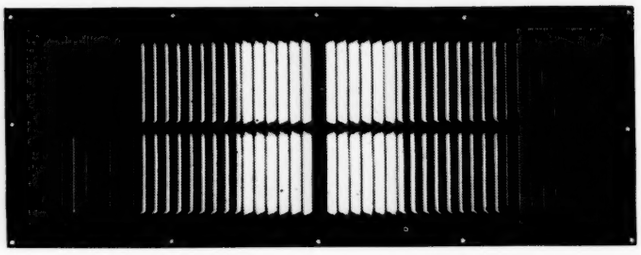
Address_____

City_____ Zone____ State_____



A Hendrick grille design (M No. 9) suitable for use with deflecting unit in Bulator combination.

The Perfect Combination
of a deflecting unit and ornamental grille



Vertical deflecting vanes, showing how the vanes may be set to produce any desired air stream pattern.

Now you can secure all the advantages of an adjustable deflecting vane grille—*to control air flow*—and an ornamental grille—*to harmonize with the decorative scheme*—by specifying the new dual-unit Hendrick BULATOR.

For this combination of deflecting unit and ornamental grille there's a wide selection of Hendrick ornamental grille designs which have ample open area so the air throw and spread are not appreciably affected.

Mounted just behind the ornamental grille, the deflecting unit is not noticeable, and its vanes are adjustable so that the air flow can be deflected to right or left, up or down, or in a combination of directions.

Write for full information.

SEE OUR CATALOG IN SWEET'S

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

HENDRICK
Manufacturing Company
42 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

Anderson W. Harris, for a number of years in charge of fire-tube boiler and fabricated product sales at the Chattanooga division of **Combustion Engineering-Superheater, Inc.,** died suddenly of a heart attack on June 2nd. His entire adult career had been spent with that company and its predecessors.

John D. Hoffman has been appointed to the newly created post of manager of direct sales of air conditioning and commercial refrigeration products of the **General Electric Co.'s** air conditioning department. Prior to his new position, Mr. Hoffman was manager of sales of G-E's Switchgear Divisions, Philadelphia, Pa. A native of Kansas City, Mo., Mr. Hoffman is also a member of the board of directors of the Trumbull Electric Manufacturing Company, Plainville, Conn., a G-E affiliate.

Philadelphia's Benjamin Foster Co. has established a new division to handle Fiberglas industrial insulations for both hot and cold applications under franchise from **Owens-Corning Fiberglas Corp.,** Toledo, Ohio.

W. A. Matheson

Appointment of **W. A. Matheson** as general manager of sales for the **Lustron Corp.** of Columbus, Ohio, has been announced. The company manufactures porcelain enamel steel homes. Before joining Lustron, Mr. Matheson was executive vice president of the Eureka Williams Corp. of Bloomington, Ill., and had been president of the Williams Oil-O-Matic Co. prior to its merger in 1945 with the Eureka Vacuum Cleaner Co. He was formerly sales manager of the Hart Oil Burner Co. of Peoria, Ill., and twice served as president of Oil Heat Institute of America. From 1936 to 1940 he was general manager of the New York office of the Delco Frigidaire Division of General Motors. He is a director of The National Bank of Bloomington, Ill.

Peter Storti has been named rotary oil burner development engineer of **Iron Fireman Manufacturing Co.** Mr. Storti will make his headquarters at the home office at Portland and will continue development of industrial oil-fired equipment.

Harold E. Strang, of Schenectady, engineering manager of the affiliated manufacturing companies department of the **General Electric Co.,** has been appointed manager of the G-E Apparatus Department's Meter and Instrument Divisions at Lynn, Mass.

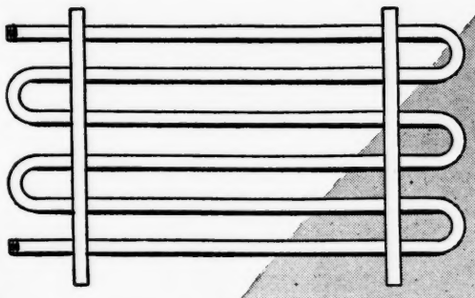
Research Products Corp. announces the addition of **Kenneth Lindquist** to its sales force. For the present, Mr. Lindquist will handle the sale of R-P air filters and related products in some of the north central states.

The Lincoln Electric Co. has completed final arrangements with The Austin Company of Cleveland for the immediate construction of an $8,500,000 plant to be erected in Euclid, Ohio. The one-story manufacturing plant will contain over 850,000 sq ft of floor area on a 65-acre site on St. Clair Avenue between E. 222nd Street and Babbitt Road. The new plant will be ready in 1950 for the transfer of all manufacturing operations from the present plant, which will be available for sale or lease at that time.

Henry M. Brundage, manager of the automatic heating division of **General Electric Co.'s** air conditioning department, Bloomfield, N. J., was awarded the honorary degree of Mechanical Engineer by the Stevens Institute of Technology at the commencement exercises on June 11.

American Air Filter Co., Inc., Louisville, Ky., has announced the appointment of **Industrial Sales & Engineering Co.,** operated by C. W. Dean, as dust control representative for the Memphis and vicinity territory.

welded steel pipe coils



Flat
Cylindrical
Box
Raceway
Oval
other types

PROMPT DELIVERY—
COMPETITIVE PRICES

SEND DRAWINGS AND SPECIFICATIONS —QUOTATIONS FURNISHED RETURN MAIL

RECO

REFRIGERATION ENGINEERING CORP.
PRODUCTS DIVISION
2020 Naudain Street, Philadelphia 46, Pa.
Phone: KIngsley 5-3630

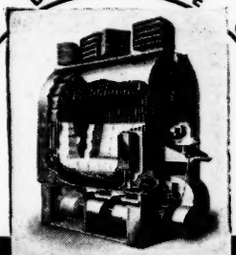
LEE

PIONEERS OF
DIRECT FIRED WARM AIR HEATERS

Heat Where Needed

DEMAND CURVE

FOLLOW THE HEAT



OF YOUR BUILDING

Heat When Needed

COUNTER-FLOW

Easy to Install

- Completely automatic with any fuel
- 80—85% efficient
- No licensed fireman

Easy to Maintain

- Floor, wall or roof mounted
- Instant pick-up from cold start
- Easy conversion to any fuel
- Ventilation in summer

- Capacities of 300,000 Btu to 8,000,000 Btu in single unit

Large Central Heaters and Process Heaters Also Available.

Write for Bulletin No. 10

LEE ENGINEERING COMPANY
95 RIVER STREET, HOBOKEN, NEW JERSEY
(Formerly Youngstown, Ohio)

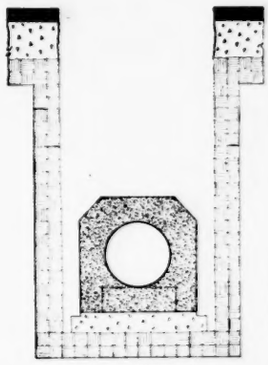
FAST! SIMPLE! ECONOMICAL! EFFICIENT!

ARMORED INSULATING CONDUITS FOR HEAVY TRAFFIC AREAS

USING "Z"crete

Cast-in-Place Insulation

The simplest yet most efficient solution to installations where traffic loads exist or where streets are frequently torn up. Ideal for underground installations because it will not disintegrate or deteriorate from wetting, exposure or electrical currents. "Z"-crete is permanent.

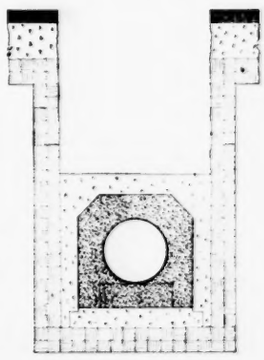


STEP ONE
at left

Steam main on pre-cast pipe supports rests on a structural concrete pad. Line is tested and a parting medium applied. Then the "Z"-crete concrete is poured, forming a solid blanket of insulation.

STEP TWO
at right

The insulating concrete is next encased in a water-repellent structural concrete. The result is practical insulation underground where trenching operations are expected.



"Z"-crete Insulating Concrete

Specially graded and mixed for underground insulation of steam, hot water and processed liquids. Furnished and installed by authorized applicators under rigid supervision. Write today for full information.

"Z"-CRETE DIVISION
ZONOLITE COMPANY
135 S. La Salle St., Dept. HV-79, Chicago 3, Illinois

BEST ALL ROUND FOR YOUR UNDERGROUND!

REPUBLIC AVIATION CORPORATION*

Farmingdale, L. I., N. Y.

***Designers and Builders of*

Famous F-84 THUNDERJET

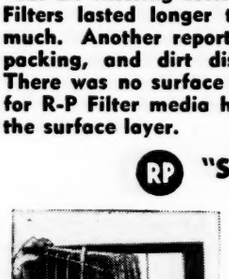
First 600-mile-per-hour fighter for U. S. Air Forces

. . . CUT AIR FILTER COST IN HALF

With more than 20,000,000 cubic feet of air per hour needed for air filtering operations at their large Farmingdale, Long Island plant, Republic gives more than casual attention to air filter costs and efficiency.

R-P Air Filters are used in 90% of Republic's air conditioning and air tempering systems. A thorough analysis made by their engineers sometime ago indicates that wherever standard replaceable filters were used, R-P Self-Seal Replacement Pad Filters "cut air filtering costs by about one-half." In addition, the R-P Filters lasted longer than many filters costing up to twice as much. Another reported advantage was the excellent "holding, packing, and dirt distribution" characteristics of R-P Filters. There was no surface clogging to excessively cut down air flow, for R-P Filter media holds dirt throughout its depth, not just on the surface layer.

RP "SNAP-IN" GRIDS USED



At Republic, as in many other large installations, R-P "Snap-In" grids also avoid the cost of constantly replacing filter frames or grids. R-P "Snap-In" grids last for years—only the filter pad need be replaced. They're time-savers, too, in filter replacement.

Typical savings in time and money, improvement in air cleaning efficiency, can be yours, too, with R-P Air Filters. Check them all—to your own profit. Call your local R-P Filter Dealer, or write for new Techni-Data Sheets.

RP PRODUCTS INCLUDE:

- **Fiber Self-Seal Air Filters**
- **ALUMALOY Self-Seal Air Filters**
- **Cardboard Frame Replacement Filters**
- **ALUMALOY E Z Kleen Air Filters**
- **ALUMALOY Industrial Washable Filters**
- **ALUMALOY Grease Filters**
- **"Snap-In" Grids for Filter Banks**
- **Self-Seal Replacement Pads**
- **Roll Filter Media**
- **Filter Bank Frames**
- **Special R-P Filter Coat**

RESEARCH PRODUCTS · CORPORATION

Dept. V, Madison 10, Wisconsin

Canadian Representative—Delhi Industries, Delhi, Ontario

Copyright 1949

RP FILTERS . . . FOR FINER LIVING

CHOSEN AS STANDARD EQUIPMENT BY LEADING MANUFACTURERS

Appointment of **Rowland J. Miller** as vice president and general sales manager has been announced by **Clayton & Lambert Mfg. Co.** Mr. Miller joined the C & L staff as a sales manager last year. He has held previous positions as general sales manager for the Ohio Fuel Gas Co., Columbus, moving up from district manager positions at Toledo, Zanesville and Cambridge, Ohio. He also served, at one time, as manager of the electrical insulation division of Owens-Corning Fiberglas Corp. of Toledo, Ohio. Mr. Miller is a graduate, in Business Administration, of Ohio State University and is a member of the National Sales Executive Club. Appointment of **Peter C. Pfriem** as sales manager, furnace pipe and fitting division, has also been announced by Clayton & Lambert.

A vote by the membership has resulted in adoption of the name **Refrigeration and Air Conditioning Contractors Association** for the former **National Association of Refrigeration Contractors.**

W. B. Connor Engineering Corp., New York, manufacturers of activated carbon refrigerated atmosphere control equipment, announce the following recent distributor appointments for their apple and pear storage units: **Richard D. Lyman**, Albion, N. Y., western and northern New York; **Jersey Fruit Products Co-op Association, Inc.**, Freehold, N. J., New Jersey and Delaware; **Hill Top Orchards and** Nurseries, Hartford, Mich., Michigan and northern Indiana; **Shantz Orchards**, Orefield, Pa., eastern border counties of Pennsylvania; **The Growers and Producers Exchange, Inc.**, Roanoke, Va., southern Virginia and southern West Virginia; **Sho-Off Orchards**, Peoria, Ill., northern Illinois and Wisconsin.

John L. Roth has been appointed to the newly created post of sales manager of the parts sales and product service section, it has been announced by the **General Electric Co.'s** air conditioning department.

Dr. Alfred Otto C. Nier, first man to isolate uranium 235, has become associated with **Minneapolis-Honeywell Regular Co.** on a consulting basis. The board of regents of the University of Minnesota, where Dr. Nier is a professor of physics, has approved a contract permitting the physicist to work with the company as a consultant on research and engineering problems, including those in connection with automatic control instruments.

According to an announcement by **Refrigeration Engineering, Inc.**, a license has been issued by that organization to the Worthington Pump and Machinery Corp. of Harrison, N. J., to use the water defrost method in refrigeration production.

Ralph H. Heberling, vice president in charge of manufacturing, of **Edward Valves, Inc.**, East Chicago, Ind., has retired, effective June 1, 1949. Mr. Heberling joined the Edward organization March 1942 as assistant to the president. He became vice president in charge of manufacturing January 1, 1944.

INDUSTRIAL DEGREE-DAYS
May, 1949

City	55F Base	45F Base
Baltimore, Md.	2	0
Buffalo, N. Y.	67	0
Chicago, Ill.	40	0
Cleveland, Ohio	39	0
Detroit, Mich.	53	1
Indianapolis, Ind.	10	0
New York, N. Y.	3	0
Philadelphia, Pa.	3	0
Pittsburgh, Pa.	15	0
St. Louis, Mo.	0	0

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

INSTRUMENT CONVENTION—1949 convention of the Instrument Society of America, at Municipal Auditorium, St. Louis, Mo. John McCaffery, assistant executive secretary of Society, 1117 Wolfendale Street, Pittsburgh 12, Pa. ..... **SEPTEMBER 12-16, 1949.**

PLUMBING AND HEATING MEETING—Annual meeting of the Plumbing and Heating Industries Bureau, at Palmer House, Chicago, Ill. Norman J. Radder, secretary of Bureau, 35 E. Wacker Dr., Chicago 1, Ill. ..... **OCTOBER 5, 1949.**

WELDING AND METALS MEETING—1949 annual meeting of the American Welding Society, in conjunction with the National Metals Congress, tentatively at Cleveland Hotel, Cleveland, Ohio. Secretary of Society, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 16, 1949.**

AGA CONVENTION—1949 annual convention, American Gas Association, at Chicago, Ill. For details, contact secretary, AGA, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 17-20, 1949.**

PUBLIC HEALTH MEETING—77th annual meeting of the American Public Health Association, and meetings of related organizations, at the Hotels Statler and New Yorker, New York City. Dr. Reginald M. Atwater, executive secretary of the Association, 1790 Broadway, New York, N. Y. ..... **OCTOBER 24-28, 1949.**

ENGINEERING AND POWER EXPOSITION—Ninth midwest and power exposition, at Navy Pier, Chicago, Ill. George E. Pfisterer, 308 W. Washington St., Chicago, managing director. ..... **NOVEMBER 11-16, 1949.**

REFRIGERATION SERVICE CONVENTION—12th annual convention, Refrigeration Service Engineers Society, at The Ambassador and Ritz Carlton hotels, Atlantic City, N. J., in conjunction with 6th All-Industry Refrigeration and Air Conditioning Exposition. W. Vernon Brumbaugh, executive secretary of REMA, 1346 Connecticut Ave., N.W., Washington 6, D. C. ..... **NOVEMBER 13-16, 1949.**

REFRIGERATION SHOW—6th All-Industry Refrigeration and Air Conditioning Exposition, at Atlantic City, New Jersey. R. K. Hanson, show director, REMA, 1107 Clark Building, Pittsburgh 22, Pennsylvania. ..... **NOVEMBER 14-18, 1949.**

INDUSTRIAL HYGIENE MEETING—14th annual meeting and professional conferences of Industrial Hygiene Foundation, at Mellon Institute, Pittsburgh, Pa. Secretary of Foundation, 4400 Fifth Ave., Pittsburgh, Pa. ..... **NOVEMBER 16-18, 1949.**

CHEMICAL EXPOSITION—22nd exposition of Chemical Industries, at Grand Central Palace, New York. Charles F. Roth, manager of the International Exposition Company, Grand Central Palace, New York 17, N. Y. ..... **NOVEMBER 28—DECEMBER 3, 1949.**

ASRE CONVENTION—46th annual convention, American Society of Refrigerating Engineers, at Edgewater Beach Hotel, Chicago, Ill. M. C. Turpin, secretary of Society, 40 W. 40th St., New York 18, N. Y. ..... **DECEMBER 4-7, 1949.**

PLANT MAINTENANCE SHOW AND CONFERENCE — First plant maintenance show and conference, in the Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 350 Fifth Ave., New York 1, N. Y., exposition management... **JANUARY 16-19, 1950.**

HEATING AND VENTILATING SHOW—Southwest Air Conditioning Exposition of the International Heating and Ventilating Exposition, State Fair Grounds, Dallas, Texas, under the auspices of the American Society of Heating and Ventilating Engineers. Charles F. Roth, manager of the International Exposition Company, Grand Central Palace, New York 17, N. Y. ..... **JANUARY 23-27, 1950.**

* *Infra Insulation*

"Your insulation* prevented the fire from spreading".

From a letter from Ralph M. Fishel & Co., Denver, Colo., insurance and private banking.

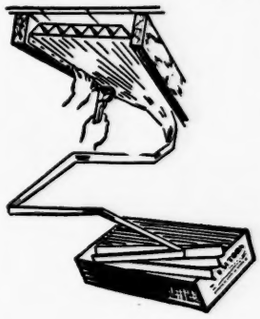
BECAUSE INFRA INSULATION

***Emits Only 3% of Heat Rays**

***Is Metal with a 1250°F Melting Point**

(Furnace Heat is Only 750°F)

***INFRA IS A REAL FIRE STOP**



Infra's surface absorbs only 3% of heat rays — 97% is rejected! Infra emits, on the opposite surface, only 3%. That is one reason why Infra is so efficient in preventing wasteful—or dangerous—heat flow. Summer or winter, Infra keeps heat in its proper place.

Infra Insulation uses 99.5% pure aluminum made in accordance with Infra's own, special emissivity specifications. The fiber partition, which creates multiple air spaces and reflective surfaces, is flame, mold, and vermin proof.

Thermal Factors Printed on Every Infra Carton

Infra C Factors and Rockwool Equivalents

C.052 Heat Flow Down, equals 6" Rockwool.
C.083 Heat Flow Up, equals 4" Rockwool.
C.10 Lateral Heat, equals 3⅓" Rockwool.

Write **FOR FREE 32-Page BOOKLET:**
"Simplified Physics of Thermal Insulation"

Architects and engineers use it as a handbook, and colleges as a text, on heat transfer, condensation, vapor, mold, radiant heating, etc. Contains chart of *k*, C, R and U factors of all insulations, of all thicknesses, weights, densities.

Address Dept. HV

MULTIPLE ACCORDION ALUMINUM and TRIANGULAR REFLECTIVE AIR CELLS

Infra INSULATION, INC.
10 Murray St., N. Y., N. Y.